

# TM 11-648

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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## RADIO RECEIVING SET

AN/FRR-39



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DEPARTMENT OF THE ARMY • NOVEMBER 1954

## **WARNING**

### **DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT**

Be careful when working on the  
115-volt ac line connections.  
Potentials up to 330 volts exist  
in the plate and power supply  
circuits.

**DO NOT TAKE CHANCES!**

TECHNICAL MANUAL }  
No. 11-648

DEPARTMENT OF THE ARMY  
WASHINGTON 25, D. C., 23 November 1954

## RADIO RECEIVING SET AN/FRR-39

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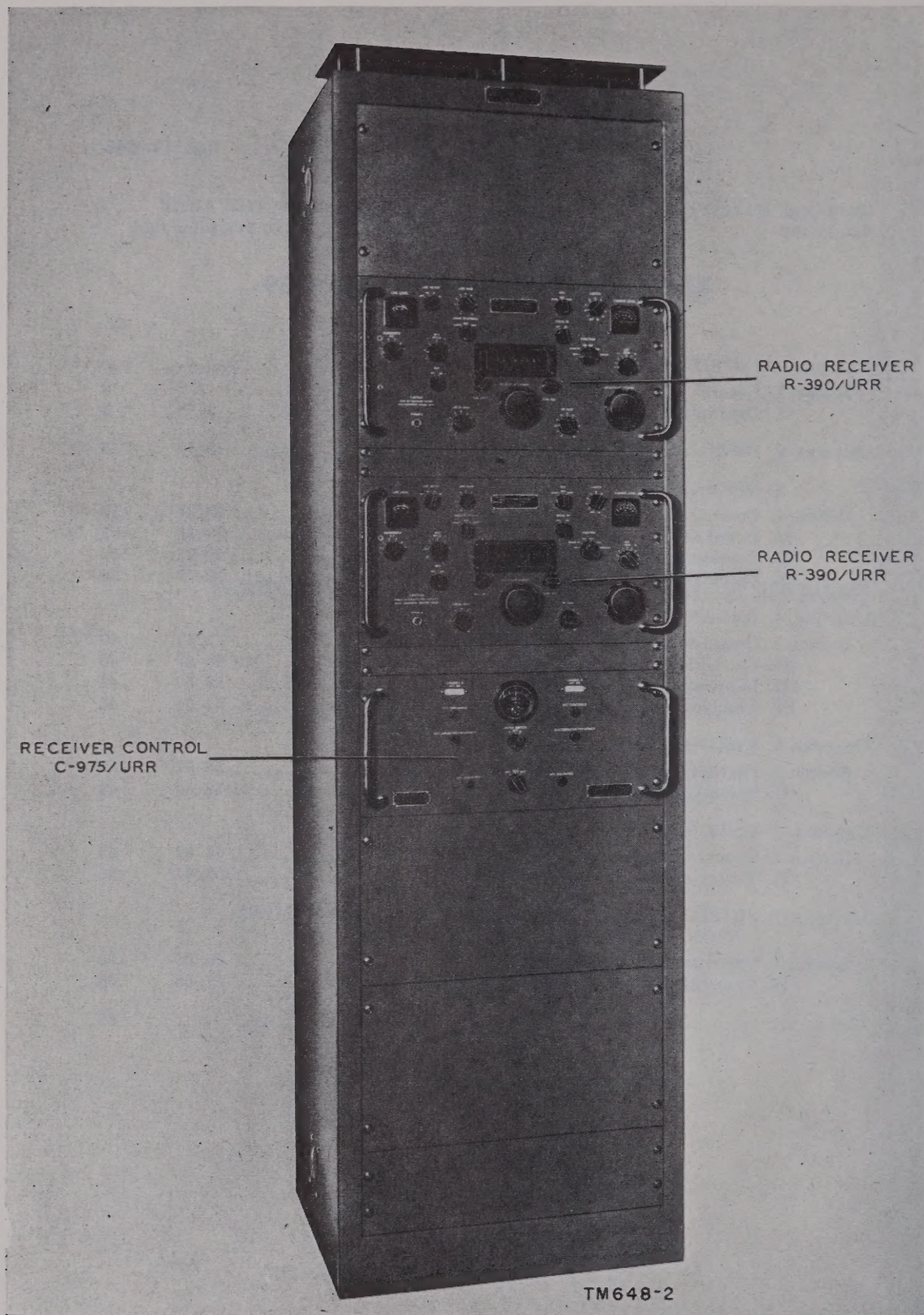


Figure 1. Radio Receiving Set AN/FRR-39.



## TECHNICAL MANUAL

## RADIO RECEIVING SET AN/FRR-39

TM 11-648

CHANGES NO. 2

HEADQUARTERS,

DEPARTMENT OF THE ARMY

WASHINGTON 25, D.C., 23 July 1961

TM 11-648, 23 November 1954, is changed as follows:

Page 3, paragraph 2. Make the following changes: Delete subparagraph *f* and substitute:

*f*. Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) direct to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J., with comments on parts listings in appendixes I and II.

Add subparagraph *g* after subparagraph *f*.

*g*. Forward all other comments on this publication direct to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N. J.

## 28. Receiver Control Bfo Frequency Adjustment

With normal operating \* \* \* the bfo frequency:

*h*. (As changed by C 1, 24 Aug 55) Adjust channel B \* \* \* meter reads 0. If it is not convenient to zero the correction meter by adjusting bfo capacitors C1609 and C-1611 (*e* and *g* above), note and log the errors in cps, as indicated by the correction meter, for each of the two channels. Compensate for the error during operation by detuning the radio receiver (par. 32*d*).

Note. A steady \* \* \* procedure as above.

## 32. Normal Diversity Operation

*d*. (As superseded by C 1, 24 Aug 55) Press

the channel A AFC DISCHARGE control. Hold it in for 15 seconds and then release it. Tune the receiver from the high side of the desired signal until the correction meter indicates SET (white mark). If the receiver control channels were not zeroed, during the preoperational adjustment of the bfo, but the errors were logged (par 28*h*), tune receiver A until the kilocycle correction meter indicates SET plus the logged error. For instance, if an error of 240 cps was noted, but was not corrected in the channel A bfo output during the preoperational adjustment, tune receiver A until the kilocycle meter indicates 440 cps (a reading of .44). This is 200 cps (the SET mark on the meter) plus the 240 cps bfo error. The bfo error, due to aging of the reactance tube, is compensated by this procedure of detuning the receiver.

## 35. Operating Notes and Precautions

*e*. (As added by C 1, 24 Aug 55) Periodically check the regulated filament voltage of Receiver Control C-975/URR at jack J1577 6.3 V RMS, on the rear of the chassis. Use the procedure outlined in paragraph 23*a* through *d*. This check is of particular importance during the first month of operating the receiver control. It is also advisable to check the B+ voltage at B+ 180 V jack J1569. If the B+ voltage is low, check tubes V1517 through V1522.

Figure 35. (As changed by C 1, 24 Aug 55) The following note is added:

4. IN RECEIVER CONTROL C-975/URR, WITH SERIAL NUMBERS OF 280 AND HIGHER, POTENTIOMETER R1646 IS 100 OHMS.

\*These changes supersede C 1, 24 August 1955, and so much of DA Supply Manual SIG 7 & 8 AN/FRR-39, 24 September 1957, as pertains to first echelon items.



## MAINTENANCE ALLOCATION

## Section I. INTRODUCTION

## 1. General

a. This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

- (1) *Part or component*. This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically.
- (2) *Maintenance functions*. This column indicates the various maintenance functions allocated to the echelon capable of performing the operations.
  - (a) *Service*. To clean, to preserve, and to replenish fuel and lubricants.
  - (b) *Adjust*. To regulate periodically to prevent malfunction.
  - (c) *Inspect*. To verify serviceability and to detect incipient electrical or mechanical failure, by scrutiny.
  - (d) *Replace*. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.
  - (e) *Repair*. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.
  - (f) *Align*. To adjust two or more components of an electrical system so that their functions are properly synchronized.
  - (g) *Calibrate*. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

(h) *Rebuild*. To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.

- (3) *1st, 2d, 3d, 4th, 5th echelon*. The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

- (4) *Tools required*. This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

- (5) *Remarks*. Entries in this column are used to clarify any of the data cited in the preceding columns.

c. Columns in section III, allocation of tools for maintenance functions chart, are as follows:

- (1) *Tools required for maintenance functions*. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.
- (2) *2d, 4th, 5th echelon*. The dagger (†) symbol indicates the echelons allocated the facility.



(3) *Tool code.* This column lists the tool code assigned.

## 2. Mounting Hardware

The basic entries of the maintenance allocation chart do not include mounting hardware such as screws, nuts, bolts, washers, brackets, clamps, etc.

## 3. Maintenance by Using Organizations

When this equipment is used by signal services organizations organic to theater headquarters or communications zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

# Section II. MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH	(4) 2ND ECH	(5) 3RD ECH	(6) 4TH ECH	(7) 5TH ECH	(8) TOOLS REQUIRED	(9) REMARKS
RECEIVING SET RADIO AN/FRR-39	service		X				1, 3	Operative check Preventive Maintenance
	adjust		X					
	inspect		X					
	replace		X					
	repair		X					
CONTROL RECEIVER C-975/URR	align			X			1, 2, 7, 8, 9, 11, 12, 13, 14	
	calibrate				X		1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14	
	rebuild					X	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	
	replace	X						
	repair		X					
CABINET ELECTRICAL EQUIPMENT C-4111PIU	rebuild							
	replace		X					
	repair			X				
	rebuild							
	replace	X						
RECEIVER, RADIO R-390/URR	repair			X				
	rebuild					X		
	replace							
	repair							
	rebuild							



# Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOL CODE	REMARKS
AN/FRR-39 (continued)							
TOOL EQUIPMENT TK-87							
MULTIMETER TS-352/U						1	
TEST SET, ELECTRON TUBE TV-7/U						2	
TOOL SET, ELECTRON TUBE TV-2/U						3	
AUDIO OSCILLATOR TS-382/U						4	
SPECTRUM ANALYZER TS-723/U						5	
TOOL EQUIPMENT TK-88						6	
MULTIMETER ME-30/U						7	
RF SIGNAL GENERATOR AN/URM-25						8	
FREQUENCY METER FR-67/U						9	
TRANSFORMER CN-16/U						10	
OSCILLOSCOPE OS-8A/U						11	
MULTIMETER ME-26/U						12	
FREQUENCY METER AN/URM-32						13	
						14	

## APPENDIX II (Added)

### BASIC ISSUE ITEMS LIST FOR RADIO RECEIVING SET AN/FRR-39

#### Section I. INTRODUCTION

##### 1. General

a. This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

b. Columns are as follows:

- (1) *Source, maintenance, and recoverability code.* Not used.
- (2) *Federal stock number.* This column lists the 11-digit Federal stock number.
- (3) *Designation by model.* Not used.
- (4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.
- (5) *Unit of issue.* The unit of issue is the supply term by which the individual item is counted for procurement, stor-

age, requisitioning, allowances, and issue purposes.

- (6) *Expendability.* Expendable items are indicated by the letter X; nonexpendable items are indicated by NX.
- (7) *Quantity authorized.* Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spares and Accessory Items", the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.
- (8) *Illustration.* The "Item No." column lists the reference symbol used for identification of the items in the illustration or text of the manual.

##### 2. References

Additional instructions concerning maintenance of this equipment are contained in:

TM 11-5820-357-10, Operator's Manual for Receiver, Radio R-390/URR. DA Supply manual SIG 7 & 8, C-975/URR.



## Section II. FUNCTIONAL PARTS LIST

(1) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL	(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPENDABILITY	(7) QUANTITY AUTHORIZED	(8) ILLUSTRATIONS FIGURE NO	(9) ITEM NO
			ITEMS COMPRISING AN OPERABLE EQUIPMENT					
			RECEIVING SET RADIO AN/FRR-39					
	5820-503-1515		RECEIVING SET, RADIO AN/FRR-39	ea	NX			
	Ord thru 53C		TECHNICAL MANUAL: TM 11-648	ea	X	2		
	5820-503-0801		CABINET, ELECTRICAL EQUIPMENT CY-1119/U	ea	NX	1		
	5820-503-0891		CONTROL, RECEIVER C-975 URR	ea	NX	1		
	5820-310-2236		INSTALLATION KIT, ELECTRICAL EQUIPMENT MK-395 FRR: (Note: This kit loses its identity once installed)	ea	X	1		
	5820-503-1242		RECEIVER, RADIO R-390 URR	ea	NX	1		
			INSTALLATION KIT, ELECTRONIC EQUIPMENT MK-395 FRR					
	5935-201-2410		ADAPTER, CONNECTOR UG-971 U: SigC dwg No. SC-C-106728	ea	X	2		
	5305-012-1887		BOLT, MACHINE: steel; cad pl; 1/4-20 UNC 2A thd; 3/4 in lg; MIL MS-35291-6	ea	X	14		
	5815-395-8945		BRACKET: interconnecting box; step shape; Collins Rad part dwg 506 7054 002	ea	X	1		
	5815-395-8943		BRACKET: pressed rack support; L shape; incl hdwe; Collins Rad part/dwg 506-3441 003	ea	X	1		
	5995-281-0807		CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL CX-2752/U: SigC dwg SM-C-170448	ea	X	1		
	5995-173-8969		CABLE ASSEMBLY, POWER, ELECTRICAL CX-2806 U	ea	X	1		
	5340-285-7720		CLAMP, LOOP: aluminum; designed to accom mat'l 1/2 in dia; Tinnerman Prod part A-3044-4-92	ea	X	3		
	5935-660-4302		CONNECTOR, PLUG, ELECTRICAL UG-573B/U	ea	X	2		
	5920-240-4114		FUSE, PLUG: 10 amp 125 v; MIL type F14D10R0A	ea	X	2	F1801	
	5995-237-6163		LEAD, ELECTRICAL: 3/8 in tinned copper braid; 6 in lg; 7/32 in dia hole ea end; SigC dwg No. SM-B-178462	ea	X	2		
	5821-509-0953		LEAD, ELECTRICAL: 3/8 in tinned copper braid; 16 in lg; 3/8 in tinned copper braid; 16 in lg; Mon Elec part ME-B-648-4A	ea	X	1		
	5310-208-1971		NUT, PLAIN, SQUARE: steel; cad pl; 1/4-20 UNC-2B thd; Spec FF-B-571 type B Style 2	ea	X	26		
	5820-503-1173		PANEL, BLANK: aluminum; gray E finish; BuShips dwg RE23F225 Size A	ea	X	1		
	5820-506-8620		PANEL, BLANK: aluminum; gray E finish; BuShips dwg RE23F225 Size C	ea	X	1		
	5820-503-1173		PANEL, BLANK: aluminum gray E finish; BuShips dwg REL3F225 Size F	ea	X	1		
	5820-141-2979		PLATE, IDENTIFICATION: aluminum; inscribed Radio Set AN/FRR-39; SigC dwg SC-D-17269-3	ea	X	1		

(1) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL	(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPENDABILITY	(7) QUANTITY AUTHORIZED	(8) ILLUSTRATIONS		(9)
							FIGURE NO	ITEM NO	
			AN/FRR-39 (continued)						
	5820-205-1046		PLATE, INSTRUCTION: aluminum, inscribed "Caution: Read Instruction's Packed With Equipment Before Using;" SigC dwg No. SC-D-17269-1	ea	X	1			
	5305-506-8709		SCREW, MACHINE: steel; cad pl; pan head; slotted dr; 2-56 NC thd 3/16 in lg; MIL MS 35223-2	ea	X	8			
	5305-550-9346		SCREW, MACHINE: brass; plain; pan head; slotted dr; 6-32 NC thd 3/8 in lg; MIL MS-35229-28	ea	X	12			
	5305-506-8738		SCREW, MACHINE: brass; pan head; 10-32 NF thd; 3/8 in lg; MIL MS-35230-61	ea	X	3			
	5305-506-8743		SCREW, MACHINE: Steel; cad pl; pan head; slotted dr; 1/4-20 UNC thd 5/8 in lg; MIL MS 35223-80	ea	X	12			
	5310-595-5974		WASHER, FLAT: rd; light; cad pl; 1/4 in id x 5/8 in od; Spec FF-W-92 type A Class A Grade 1	ea	X	26			
	5310-209-3979		WASHER, LOCK: med; steel; cad pl; split helical; 1/4 in nom bolt size; MIL MS-35338-44	ea	X	26			
			RUNNING SPARES AND ACCESSORY ITEMS						
			RECEIVING SET RADIO AN/FRR-39						
			INSTALLATION KIT ELECTRONIC EQUIPMENT MK-395/FRR						
	5935-201-2410		ADAPTER, CONNECTOR UG-971/U: SigC dwg No. SC-C-106728	ea	X	1			
	5935-660-4302		CONNECTOR, PLUG, ELECTRICAL UG-5738/U	ea	X	1			
	5920-210-4114		FUSE, PLUG: 10 amp 125 v; MIL type F14D10ROA	ea	X	5			



BY ORDER OF THE SECRETARY OF THE ARMY:

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USATC Inf (2)  
Svc Colleges (2)  
Br Svc Sch (2)  
GENDEP (2) except  
    Atlanta GENDEP (None)  
Sig Sec, GENDEP (5)  
Sig Dep (12)  
Ft Monmouth (75)  
AFIP (1)  
WRAMC (1)

AFSSC (1)  
USAEPG (2)  
EMC (1)  
USACA (2)  
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USASSA (20)  
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Army Pictorial Cen (2)  
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11-95  
11-97  
11-117  
11-155  
11-500 (AA-AE) (4)  
11-557  
11-587  
11-592  
11-597

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.











## DEPARTMENT OF THE ARMY TECHNICAL MANUAL

## OPERATOR'S MANUAL

### RADIO RECEIVER R-390/URR

Headquarters, Department of the Army, Washington 25, D. C.

29 December 1960

### WARNING

#### DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 240-volt power supply and the circuits connected to it, or on the 115/230-volt ac line connections. Before connecting the receiver to an ac source, be sure that the chassis is connected to the same ground as the ac source.

#### DON'T TAKE CHANCES!

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\*This manual supersedes TM 11-5820-357-10P, 4 November 1959, and such portions of TM 11-856, 11 January 1955, including C1, 23 June 1955, C2, 29 September 1955, C3, 19 January 1956, C4, 22 December 1958, and C5, 31 December 1959, as pertains to operation of equipment.

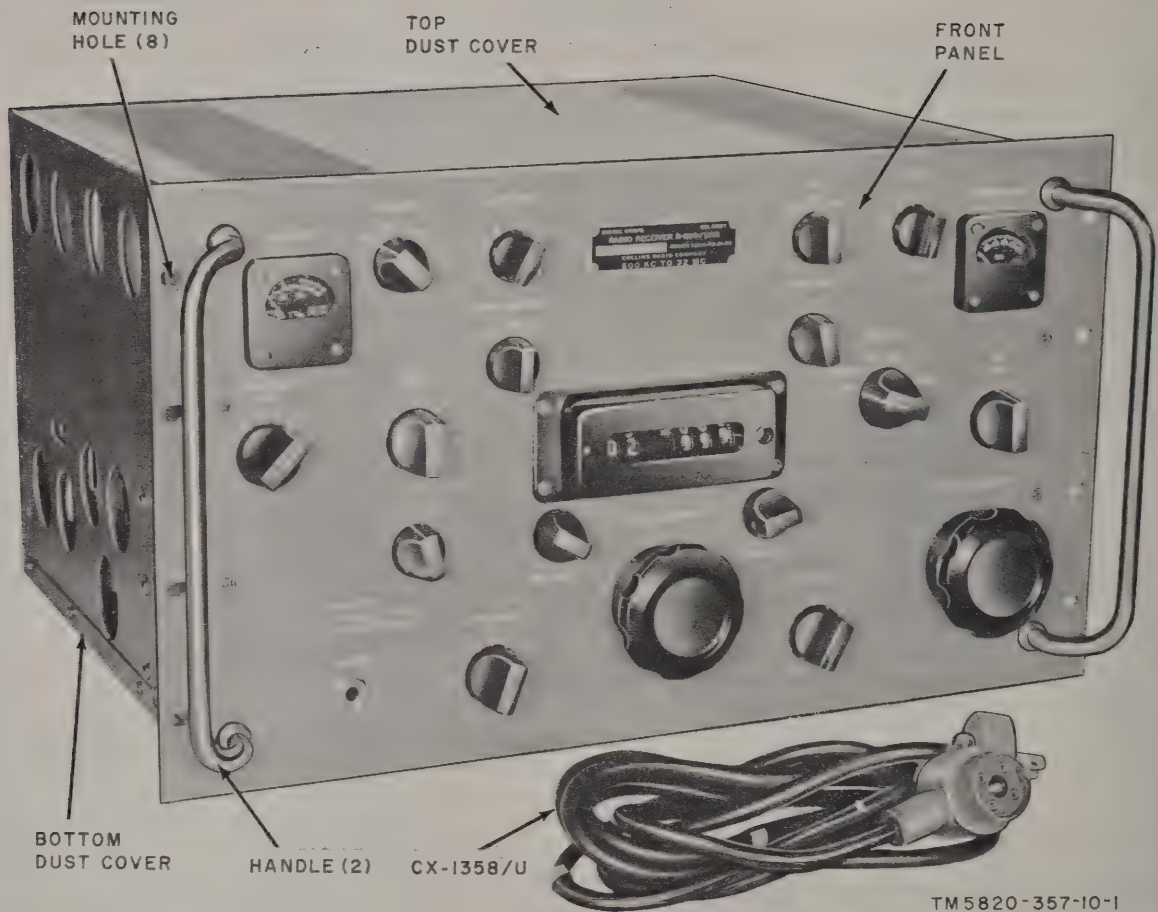


Figure 1. Radio Receiver R-390/URR.



TECHNICAL MANUAL

OPERATOR'S MANUAL

RADIO RECEIVER R-390/URR

TM 11-5820-357-10 }  
CHANGES No. 3 }

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON 25, D.C., 18 July 1963

TM 11-5820-357-10, 29 December 1960, is changed as follows:

*Page 3.* Add paragraph 1.1 after paragraph 1.

### 1.1. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P ect.) and the latest changes to and revisions of each equipment publication.

Delete paragraph 2 and substitute:

## 2. Forms and Records

*a. Reports of Maintenance and Unsatisfactory Equipment.* Use equipment forms and records in accordance with instructions in TM 38-750.

*b. Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publications 378 (Navy), and AFR 71-4 (Air Force).

*c. Comments on Manual.* Forward all comments on this publication direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N.J. (DA Form 1598 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or letter may be used.)

*Page 13,* figure 8 (part 2 of 2), step 7. Add the following caution.

**Caution:** When turning the ZERO ADJ control knob, be careful not to force the knob counterclockwise beyond the stop. The shaft can be turned to a point at which the plate on the end of the shaft is forced off.

*Page 24.* Delete figure 14.

*Page 25.* Delete paragraph 20 and substitute:

## 20. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

*a. Systematic Care.* The procedures given in paragraphs 20.1 and 20.2 cover systematic care essential to proper upkeep and operation of the equipment. The cleaning operations (par. 20.3) should be performed once a day. If the equipment is not used daily, the cleaning operations must be performed before operation after any extended shutdown, or once a week while the equipment is kept in a *standby* condition. The other items must be checked before the equipment is placed in operation after a shutdown, during operation, or after it is turned off, as specified in the applicable paragraph.

*b. Preventive Maintenance Checks and Services.* The preventive checks and services chart (par. 20.2) outlines inspections to be made each day. These checks and services are made to maintain Army equipment in a combat serviceable condition; that is, in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to inspect, how to inspect, and what the normal

conditions are; the *References* column lists the paragraph or figure that contains additional information. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records of these checks and services must be made in accordance with TM 38-750.

## 20.1. Preventive Maintenance Checks and Service Periods

a. Preventive maintenance checks and services of the R-390/URR are required on a daily basis.

b. Paragraph 20.2 specifies services and inspections that must be accomplished daily and under special conditions listed below for transportable and mobile installations.

- (1) When the equipment is initially installed.
- (2) When the equipment is reinstalled after removal for any reason.
- (3) At least once each week if the equipment is maintained in a *standby* condition.

## 20.2. Daily Preventive Maintenance Checks and Service Charts

Sequence No.	Item	Procedure	References
1	Exterior surfaces -----	Clean the receiver dust covers and panel; clean the frequency indicator glass and meter glasses.	Par. 20.3.
2	Frequency indicator glass; meter glasses.	Inspect frequency indicator glass and the meter glasses for cracks and breaks.	Fig. 1.
3	Cords and cables -----	Check cords and cables for cracks and breaks----	None.
4	Connectors -----	Inspect connectors on the rear of the receiver for tightness.	None.
5	Knobs and switches -----	While making the operational test (item 6) check the mechanical action of each knob and switch for external and internal binding.	Fig. 6.
6	Operational test -----	Perform the steps as given in the operational checklist.	Par. 23c.

## 20.3. Cleaning

Inspect the exterior of the receiver. The exterior should be clean, and free of dust, dirt, grease, and fungus.

**Warning:** Cleaning Compound (Federal stock No. 7930-395-9542) is flammable and its fumes are toxic. Provide adequate ventilation.

**Do not use near a flame.**

a. Remove dirt and dust with a clean soft cloth. Dampen the cloth with cleaning compound if necessary.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with cleaning compound.

c. Remove dirt from the frequency indicator glass and the meter glass with a cloth dampened with cleaning compound.

**Caution:** To prevent breakage, do not press on the glass.

d. Remove dust and dirt from the jacks and plugs with a brush.

e. Clean the panel and control knobs with a soft cloth. If necessary, dampen the cloth with water and use mild soap.

Page 28. Add the following to appendix I.  
TM 38-750 The Army Equipment Record System and Procedures.



By Order of the Secretary of the Army:

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*General, United States Army,  
Chief of Staff.*

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5-15  
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11-117  
11-155  
11-157  
11-500 (AA-AC) (4)  
11-557  
11-587  
11-592  
11-597  
32-51  
32-56  
32-57  
32-67  
32-78

NG: State AG (3); units—same as active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.



# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1. Scope

This manual describes Radio Receiver R-390/URR (fig. 1) and covers its operation and operator's maintenance. It includes operation under usual conditions, methods of cleaning and inspecting the equipment, and replacement of parts available to first echelon maintenance. Throughout this manual, Radio Receiver R-390/URR will be referred to as the *receiver*.

#### 2. Forms and Records

##### a. Unsatisfactory Equipment Reports.

- (1) Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to the Commanding Officer, U.S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J., as prescribed in AR 700-38.
- (2) Fill out and forward AF TO Form 29 (Unsatisfactory Report) to the Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AR TO 00-35D-54.

b. *Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army); Navy Shipping Guide, Article 1850-4 (Navy); and AFR 71-4 (Air Force).

c. *Preventive Maintenance Forms.* Prepare DA Form 11-238 (fig. 12), Maintenance Checklist for Signal Equipment (Sound Equipment, Radio, Direction Finding, Radar, Carrier, Radiosonde and Television), in accordance with instructions on the form.

d. *Parts List Form.* Forward DA Form 2028, Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9, directly to the Commanding Officer, U.S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J., with comments on parts listing.

e. *Comments on Manual.* Forward all other comments on this publication directly to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: PA2d, Fort Monmouth, N. J.

### Section II. DESCRIPTION AND DATA

#### 3. Purpose and Use

a. Radio Receiver R-390/URR is a general purpose receiver for use in fixed and mobile applications. The receiver provides for recep-

tion of continuous wave (cw), modulated-continuous-wave (mcw) amplitude-modulated (am.), frequency shift keyed (fsk), and single-sideband signals.

b. The receiver furnishes audiofrequency (af) output power to a local loudspeaker and headset or a balanced line. An intermediate frequency (if.) output is also provided so that received radio teletypewriter signals may be fed to other equipment for conversion into signals usable by teletypewriter equipment.

#### 4. System Application

##### a. Space-Diversity Receiving System.

- (1) Two or three receivers can be connected as a space-diversity receiving system for reception of voice signals (fig. 2). This system provides sub-

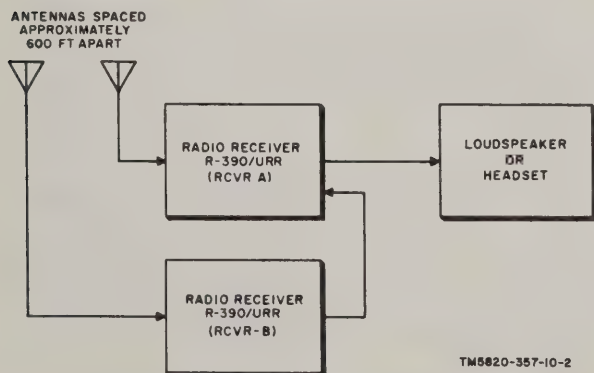
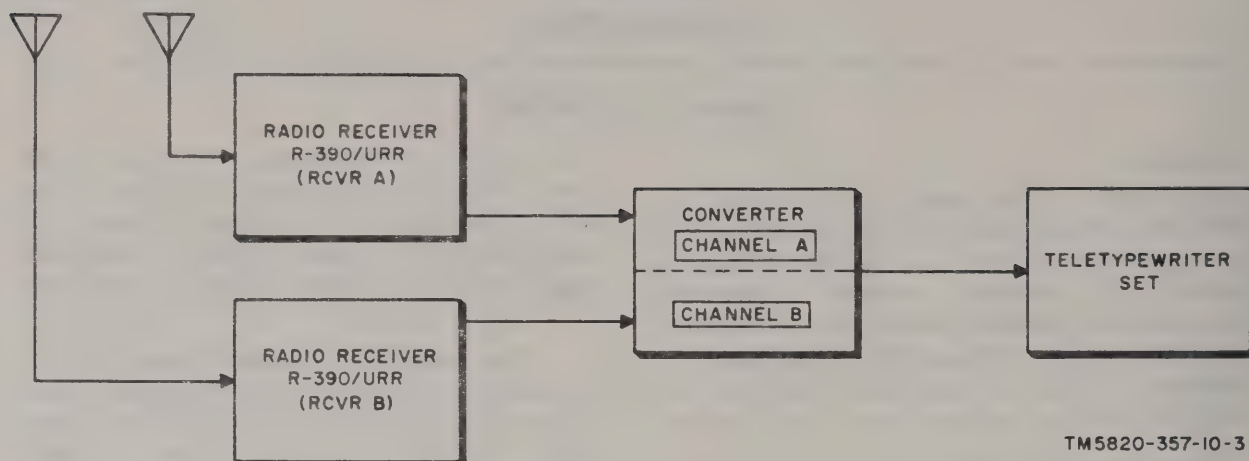


Figure 2. Space diversity receiving system.

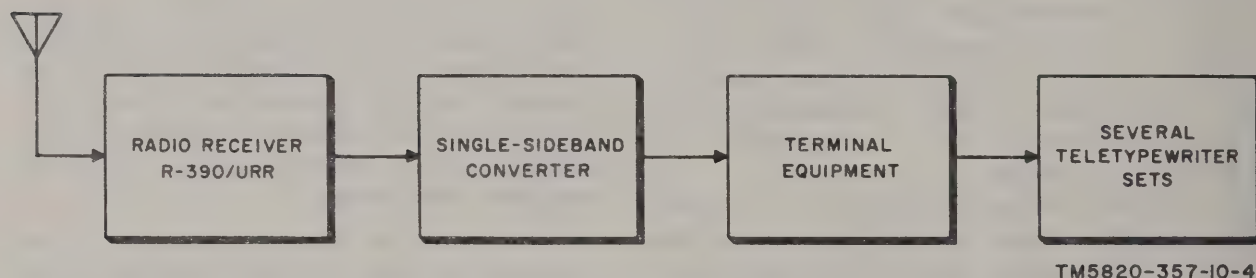


ANTENNAS SPACED  
APPROXIMATELY  
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TM5820-357-10-3

Figure 3. Space-diversity radio teletypewriter system.



TM5820-357-10-4

Figure 4. Single-sideband radio teletypewriter system.

stantially uniform audio output to a loudspeaker or headset, minimizing the effect of fading signals.

- (2) Rhombic or doublet antennas spaced at least 600 feet apart are connected to the two receivers.

*b. Space-Diversity Radio Teletypewriter System.* Figure 3 shows two receivers connected in a space-diversity radio teletypewriter system. The doublet or rhombic antennas feed the incoming frequency-shift signals to the receivers. The outputs of the receivers are applied to a converter which provides diversity combining and produces direct current (dc) signals for the operation of teletypewriter equipment.

*c. Single-Sideband Radio Teletypewriter System.* A receiver and Single Sideband Converter CV-157/URR are connected as shown in figure 4 for the reception of single-sideband (ssb) multichannel radio teletypewriter sig-

nals occupying 12 kilocycles (kc) of radio-frequency (rf) spectrum space divided into two 6-kc sidebands, one 6-kc sideband on each side of a reduced carrier. A double-sideband signal, either am. or phase-modulated (pm), occupying up to a total of 12 kc of spectrum space also can be received. For additional information, refer to TM 11-649.

## 5. Technical Characteristics

Frequency range .... 0.5 to 32 mc in 32 bands.

Type of signals received A1 (cw), A2 (mcw), A3 (voice), F1 (frequency-shift keying), and A9 (composite transmissions such as multi-channel radio teletypewriter signals).

Type of tuning ..... Continuous; frequency read directly on counter-type indicator.

Calibration points .. Every 100 kc.  
 Power source ..... 115/230 volts ac, 48-62  
 cps ( $\pm 10\%$ ).  
 Power input ..... 270 watts total; 170 watts  
 with oven heaters off.

**Antenna require-  
ments:**

Unbalanced .... Random length straight-  
 wire or vehicular-  
 mounted whip.

Balanced ..... 125-ohm nominal termi-  
 nating impedance;  
 - matches 50- to 200-ohm  
 balanced transmission  
 lines or unbalanced  
 lines, using adapters.

**6. Components of receiver**

*a. Components.* The components of Radio  
 Receiver R-390/URR are listed in the fol-  
 lowing chart.

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb)
1	Radio Receiver R-390/URR .....	10½	17¼	19	65
1	Power Supply PP-621/URR .....	5⅞	4⅞	6¾	15
1	Power Cable Assembly CX-1358/U .....			96	0.677
2	Technical manuals .....				2
1 Set	Running spares ( <i>b</i> below) .....				2
Total					84.677

*b. Running Spares (fig. 5).*

Quantity	Item
1	Electron tube, 6AJ5
1	Electron tube, 6AK6
1	Electron tube, 6BH6
2	Electron tube, 6BJ6
1	Electron tube, 6C4
1	Electron tube, 12AT7WA
2	Electron tube, 12AU7
1	Electron tube, 5651
1	Electron tube, 5749/6BA6W
2	Electron tube, 5814A
1	Electron tube, 6082
1	Electron tube 26Z5W (For PP-621/URR)
6	Fuses, cartridge, 3 amp, 125v
5	Fuse, cartridge, ⅜ amp, 250v
1	Lamp, 0.04 amp, 28v
1	Resistor, current-regulating, TJ311MOI

**7. Description**

*a.* The receiver (fig. 1) is designed for  
 mounting in a standard 19-inch rack or a  
 table-top cabinet.

*b.* All operating controls, indicators, and  
 a phones jack are located on the front panel.  
 Two handles are provided for removing the  
 receiver from the rack or cabinet. The chassis  
 is enclosed by dust covers which may be re-  
 moved when the receiver is installed in a cab-  
 inet.

*c.* Antenna connectors, operating and spare

fuses, a power cable, an if. connector, an  
 OVENS switch, terminal boards, and special  
 tools for use by higher echelon personnel, are  
 mounted on the rear panel (fig. 15). Cutouts  
 are provided to permit access to internal con-  
 trols used by higher echelon personnel.

**8. Additional Equipment Required**

The following material is not supplied as a  
 part of Radio Receiver R-390/URR but is  
 required for its operation. The connectors re-  
 quired will depend on the particular installa-  
 tion.

**Antenna:**

Balanced ..... Doublet or rhombic.  
 Unbalanced ..... Random-length  
 straight-wire or  
 whip.

**Low-impedance  
transmission line:**

Balanced ..... 50 to 200 ohm.  
 Unbalanced .... 70-ohm coaxial cable.  
 Connector ..... Connector Plug UG-  
 970/U or connec-  
 tor Plug UG-971  
 U.

Headset ..... Headset Navy type  
 CW-49507 or

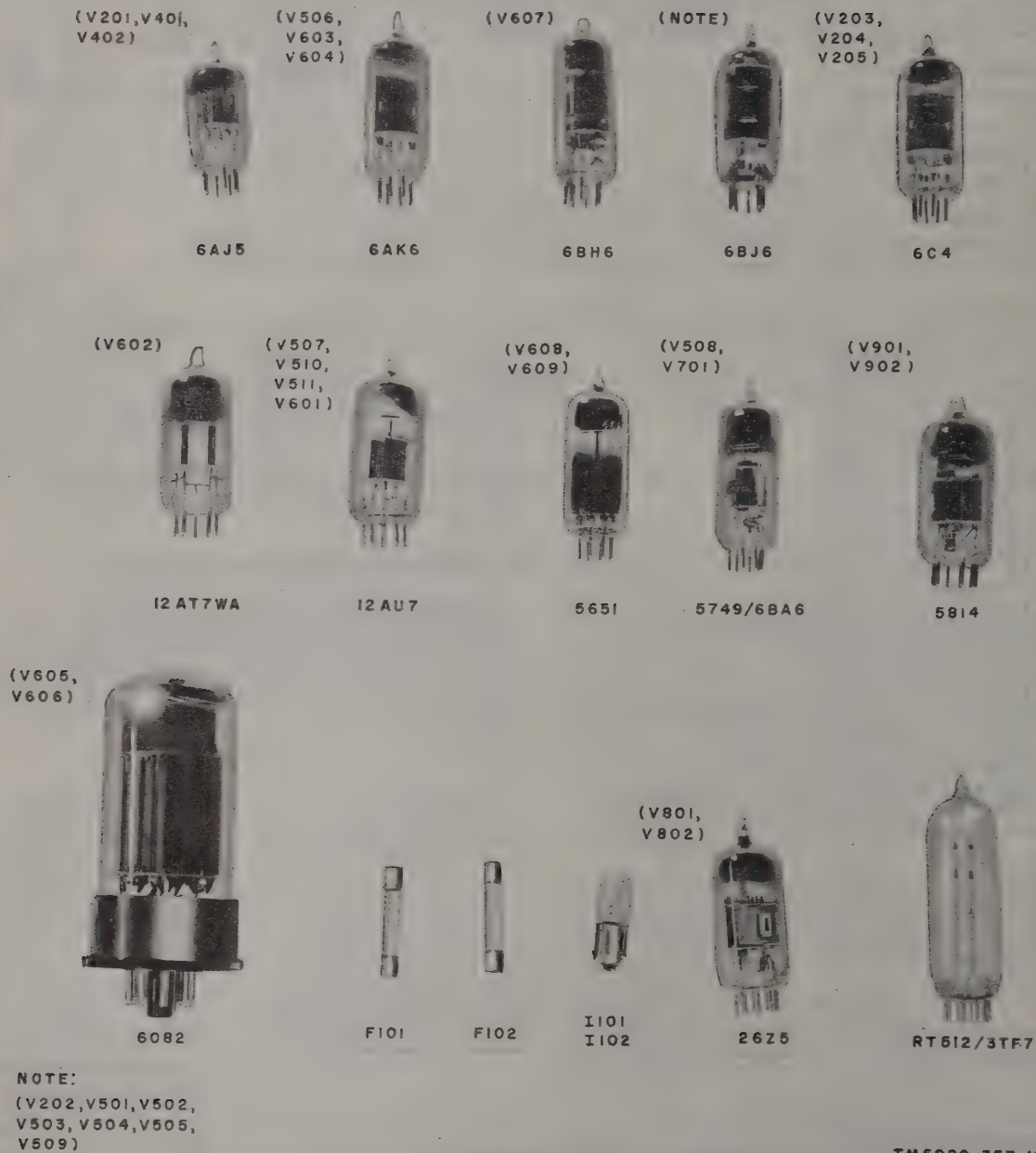
equivalent 600-ohm headset.

Mounting and housing facilities' Standard 19-inch rack or cabinet

Cord ..... Headset Cord CX-1334/U, or equivalent.

Loudspeaker ..... LS-166/U or equivalent.

such as: CY-1119/U or CY-917/URR (fixed) or CY-1216/U or CY-979/URR (mobile).



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Figure 5. Running spares.



## CHAPTER 2

### OPERATING INSTRUCTIONS

*Note.* This chapter covers only items *used by the operator*; items used by maintenance personnel are covered in instructions for the appropriate maintenance echelon. Installation instructions are covered in instructions for the appropriate maintenance echelon.

#### 9. General

Take the following precautions, when setting the controls.

a. Check to see that the 115V-230V switch is in the proper position for the source of voltage being used. If this switch is placed in the 115V setting when the receiver is connected to a 230V source, the power fuses will blow and possible damage to the receiver may result.

b. Do not turn the MEGACYCLES CHANGE control beyond 00 or 31 megacycles.

c. Do not turn the KILOCYCLES

CHANGE control beyond 000 counterclockwise or 999 clockwise. If a plus or minus sign appears in the third indicator column from the left, the control has been turned too far.

d. Do not turn the FUNCTION switch counterclockwise beyond OFF or clockwise beyond SQUELCH.

#### 10. Controls and Indicators

(fig. 6)

The receiver controls and indicators and their functions are listed in the following chart.

Control or indicator	Function										
LINE LEVEL meter .....	Indicates level of balanced-line output.										
LINE METER switch .....	<table> <tr> <th>Position</th><th>Function</th></tr> <tr> <td>OFF</td><td>Disconnects LINE LEVEL METER from balanced-line output.</td></tr> <tr> <td>+10</td><td>Adds 10 vu to LINE LEVEL reading.</td></tr> <tr> <td>0</td><td>LINE LEVEL meter is read directly in vu</td></tr> <tr> <td>-10</td><td>10 vu is to be subtracted from the LINE LEVEL vu reading.</td></tr> </table>	Position	Function	OFF	Disconnects LINE LEVEL METER from balanced-line output.	+10	Adds 10 vu to LINE LEVEL reading.	0	LINE LEVEL meter is read directly in vu	-10	10 vu is to be subtracted from the LINE LEVEL vu reading.
Position	Function										
OFF	Disconnects LINE LEVEL METER from balanced-line output.										
+10	Adds 10 vu to LINE LEVEL reading.										
0	LINE LEVEL meter is read directly in vu										
-10	10 vu is to be subtracted from the LINE LEVEL vu reading.										
LINE GAIN control .....	Controls level of af signal supplied to balanced line output terminals.										
AGC SWITCH .....	A three-position switch that determines rapidity of change in gain of receiver for a certain change of signal strength.										
LIMITER switch .....	In any position other than OFF, is adjustable to limit static interference. Increased reduction of static interference is obtained at clockwise positions of this control.										
CARRIER LEVEL meter .....	Indicates level of incoming signal.										
BANDWIDTH KC control .....	Causes receiver to reject frequencies that differ from the carrier frequency by more than the indicated control setting.										
BFO PITCH control .....	Varies pitch of tone when receiving CW signals.										
AUDIO RESPONSE switch .....	Varies the response of the audio amplifier.										
	<table> <tr> <th>Position</th><th>Function</th></tr> <tr> <td>SHARP</td><td>An 800-cps filter is inserted into the audio circuit and will only pass audio signals of 800 cps or less.</td></tr> <tr> <td>MED.</td><td>An 3,500-cps filter is inserted into the audio circuit and will only pass audio signals of 3,500 cps or less.</td></tr> <tr> <td>WIDE</td><td>No filters are used in this position, and the width of the received audio signal will be limited only by the type of transmission and the design characteristics of the receiver.</td></tr> </table>	Position	Function	SHARP	An 800-cps filter is inserted into the audio circuit and will only pass audio signals of 800 cps or less.	MED.	An 3,500-cps filter is inserted into the audio circuit and will only pass audio signals of 3,500 cps or less.	WIDE	No filters are used in this position, and the width of the received audio signal will be limited only by the type of transmission and the design characteristics of the receiver.		
Position	Function										
SHARP	An 800-cps filter is inserted into the audio circuit and will only pass audio signals of 800 cps or less.										
MED.	An 3,500-cps filter is inserted into the audio circuit and will only pass audio signals of 3,500 cps or less.										
WIDE	No filters are used in this position, and the width of the received audio signal will be limited only by the type of transmission and the design characteristics of the receiver.										

Control or indicator	Function												
FUNCTION switch .....	When rotated to any position other than OFF, connects receiver to power source and selects desired receiver function. The positions and functions are as follows:												
	<table> <tr> <th>Position</th><th>Function</th></tr> <tr> <td>STAND BY</td><td>Receiver is disabled but the filaments remain lighted and oscillators remain on; receiver is ready for instant use.</td></tr> <tr> <td>AGC</td><td>Gain is controlled automatically for normal reception.</td></tr> <tr> <td>MGC</td><td>AGC disabled; gain is controlled manually by RF GAIN control or an external gain control.</td></tr> <tr> <td>CAL</td><td>Supplies CAL signals at 100-kc checkpoints.</td></tr> <tr> <td>SQUELCH</td><td>Squelch circuit is connected for silencing receiver when input signal falls below a level determined by setting of RF GAIN control. This enables the operator to monitor any frequency without having to listen to noise between transmissions.</td></tr> </table>	Position	Function	STAND BY	Receiver is disabled but the filaments remain lighted and oscillators remain on; receiver is ready for instant use.	AGC	Gain is controlled automatically for normal reception.	MGC	AGC disabled; gain is controlled manually by RF GAIN control or an external gain control.	CAL	Supplies CAL signals at 100-kc checkpoints.	SQUELCH	Squelch circuit is connected for silencing receiver when input signal falls below a level determined by setting of RF GAIN control. This enables the operator to monitor any frequency without having to listen to noise between transmissions.
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STAND BY	Receiver is disabled but the filaments remain lighted and oscillators remain on; receiver is ready for instant use.												
AGC	Gain is controlled automatically for normal reception.												
MGC	AGC disabled; gain is controlled manually by RF GAIN control or an external gain control.												
CAL	Supplies CAL signals at 100-kc checkpoints.												
SQUELCH	Squelch circuit is connected for silencing receiver when input signal falls below a level determined by setting of RF GAIN control. This enables the operator to monitor any frequency without having to listen to noise between transmissions.												
BREAK IN switch .....	In ON position, control of the receiver from a remote location is possible, and the receiver is protected from RF voltage from nearby transmitters.												
-ANT. TRIM + control .....	Provides means for tuning antenna circuit for maximum signal input.												
BFO switch .....	Places bfo in operation.												
DIAL LOCK control .....	Locks KILOCYCLE CHANGE control to prevent accidental change of setting.												
ZERO ADJ. control .....	When turned clockwise, disengages frequency indicator from KILOCYCLE CHANGE control for calibration purposes.												
LOCAL GAIN control .....	Controls level of af signal to headset or speaker.												
RF GAIN control .....	Controls gain of rf and if. amplifiers. When squelch circuit is operative, controls squelch and permits maximum agc when in the maximum clockwise position.												
MEGACYCLE CHANGE control ....	Selects any one of 32 tuning steps; change reading of first two digits of frequency indicator.												
KILOCYCLE CHANGE control .....	Tunes receiver to any frequency within a band and changes reading of last three digits on the frequency indicator.												
PHONES jack .....	Provides means of connecting a headset to the receiver.												

## 11. Preparing Receiver for Reception

To prepare the receiver for reception, follow the steps in figure 7.

## 12. Calibration Procedures

Frequency indicator calibration is required to maintain the tuning accuracy of the receiver. Calibrate the frequency indicator at the 100-kc checkpoint nearest the frequency desired for reception whenever the MEGACYCLE CHANGE control is operated to select another band. Follow the procedures given in figure 8. (For greatest accuracy and sta-

bility, the receiver should be allowed to warm up for at least 30 minutes.)

## 13. Reception of Voice Signals

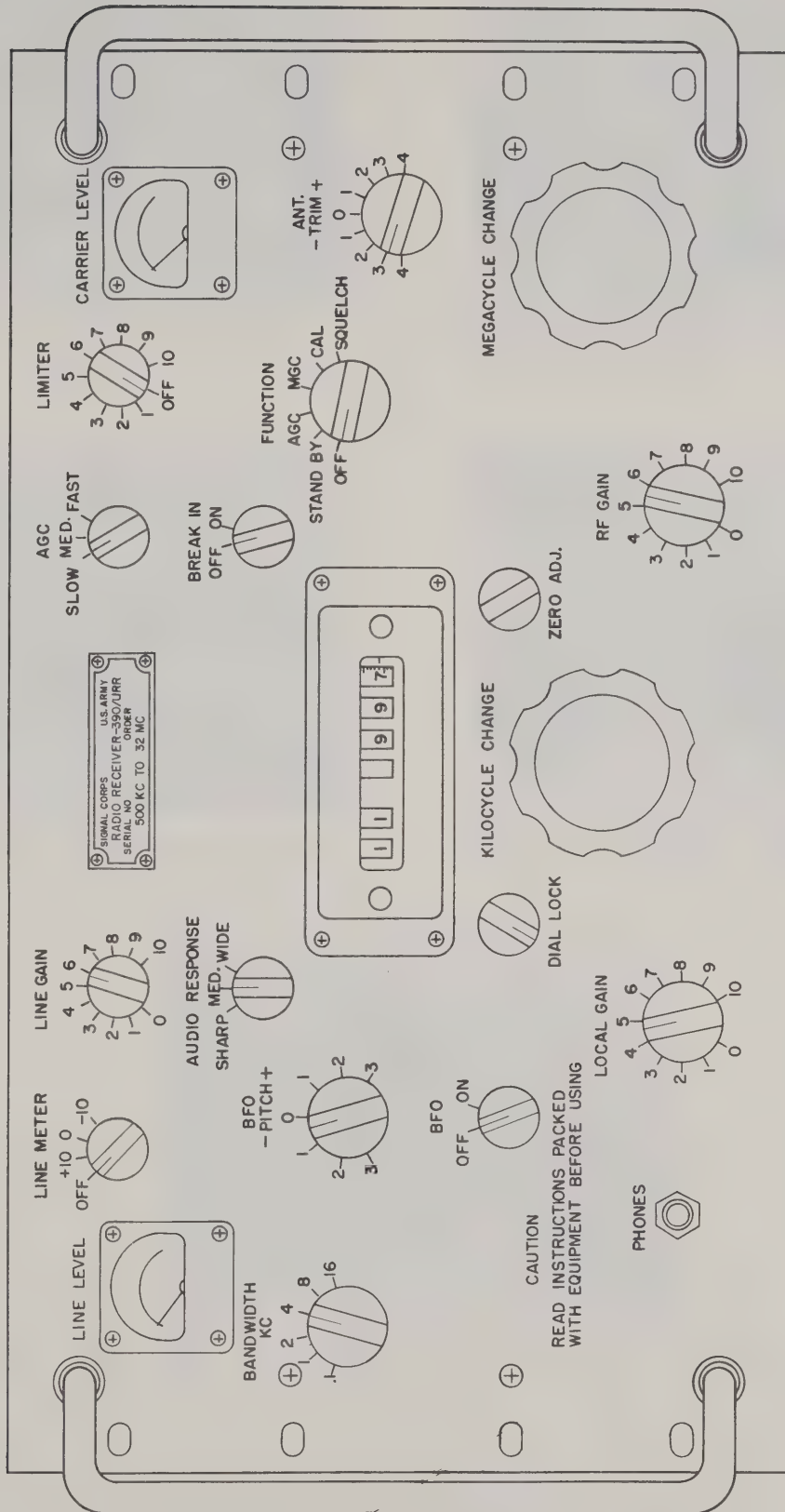
To receive voice signals, follow the procedures given in figure 9.

## 14. Reception of Cw and Mcw Signals

Operate the receiver controls in the same manner as for voice reception, (fig. 9) and then follow the procedures given in figure 10.

## 15. Reception of Frequency-Shift Signals

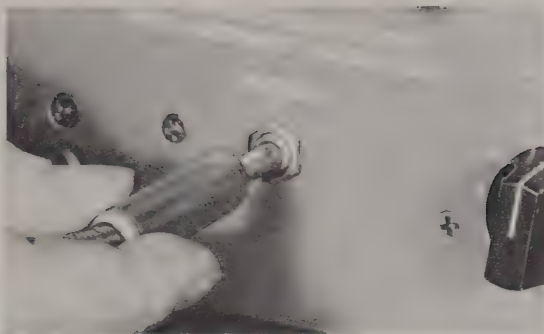
Operate the receiver in the same manner as



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Figure 6. Radio Receiver R-390/URR, front panel.





**1** Plug a headset Navy Type CW-49507 or equivalent into PHONES jack on front panel.



**3** Turn the LINE GAIN control to 0.



**2** Turn the FUNCTION switch to AGC. Allow the receiver to warm up for several minutes before operating it.



**4** Turn the RF GAIN control to 10.



**5** Turn the LOCAL GAIN control to 6.

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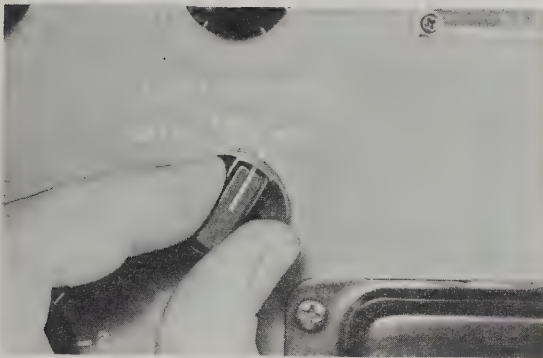
*Figure 7. Preparing receiver for reception (part 1 of 2).*



**6** Turn the BANDWIDTH switch to 8.



**8** Turn the AGC switch to MED.



**7** Turn the AUDIO RESPONSE switch to WIDE.



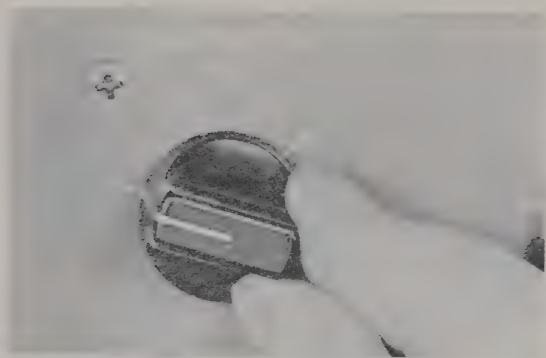
**9** Turn the LIMITER control to OFF.



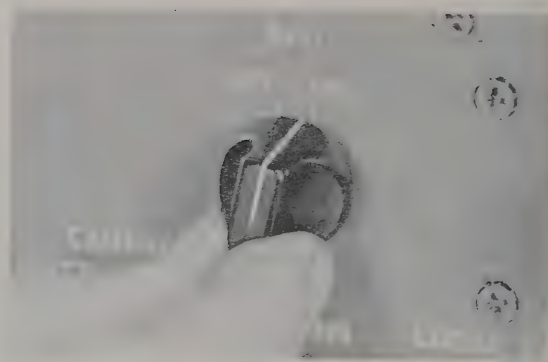
**10** Turn the DIAL LOCK control counter-clockwise until it stops.

TM5820-357-10-7(2)

*Figure 7. Preparing receiver for reception (part 2 of 2).*



**1** Set the BANDWIDTH switch to the .1 position.



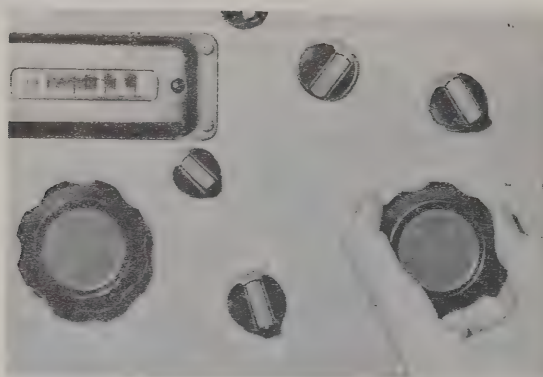
**3** Turn the BFO switch to ON.



**2** Turn the BFO pitch control to 0.



**4** Turn the FUNCTION switch to CAL.

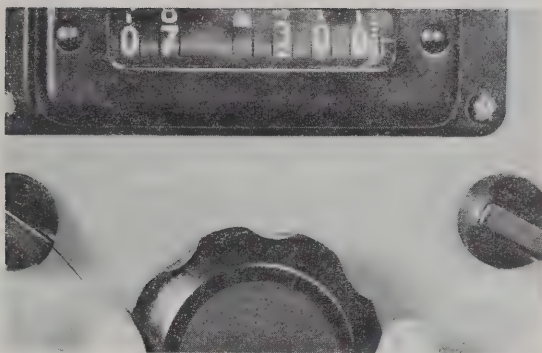


**5** Adjust the MEGACYCLE CHANGE control to the megacycle band that includes the frequency desired for reception. In this example, the frequency is being set to 7335 kc; for this frequency, the nearest check point is 7300 kc.

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*Figure 8. Calibration procedure (part 1 of 2).*



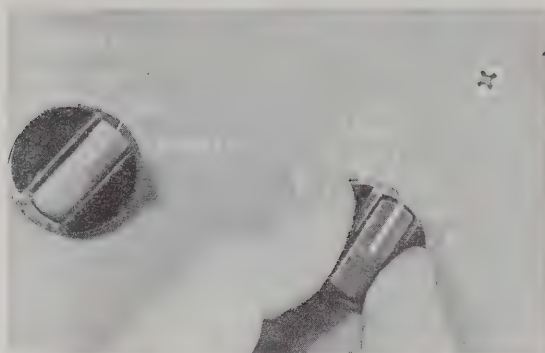


**6** Adjust the KILOCYCLE CHANGE control so that the frequency indicator is at the 100-kc check point nearest the frequency desired for reception (7300 kc in this example).

**Note:** If a red plus or minus sign appears, do not turn the dial any further in that direction.



**7** Turn the ZERO ADJ control fully clockwise.



**8** Rotate the ANT. TRIM control to obtain indication on CARRIER LEVEL meter.

**9** Adjust the KILOCYCLE CHANGE control (see step 6) for a zero beat indication in the headset or speaker. Zero beat is indicated by a tone diminishing in pitch until it cannot be heard until the control is either turned further in the same direction or turned back towards the position it was in upon starting. The dial is now accurately calibrated.

**10** Turn the ZERO ADJ control (step 7) fully counterclockwise.

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*Figure 8. Calibration procedure (part 2 of 2).*

for reception of cw and mcw signals, and then follow the procedure given in figure 11. This procedure should be used for tuning the receiver to frequency-shift signals, unless another procedure is given in the technical manual covering the particular receiving system. The receiver requires exact tuning for the proper reception of frequency-shift signals. The entire procedure applies only to systems that use the audio output of the receiver, such as Radioteletypewriter Terminal Equipment AN/FGC-1. Omit the procedure given in figure 11 for equipments that use the if. output

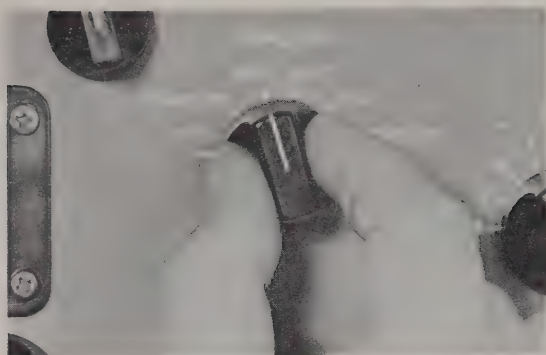
of the receiver, such as Frequency-Shift Converter CV-116/URR.

## 16. Reception of Single-Sideband Signals

Operate the receiver in the same manner as for reception of cw and mcw signals, and then follow the procedure given in figure 12.

## 17. Stopping Procedure

If the receiver is not going to be used for a short interval (under 10 minutes), place the FUNCTION switch in STANDBY position. When the receiver is no longer needed for



**1** Turn the FUNCTION SWITCH to AGC.



**4** Turn the LOCAL GAIN control to 6.



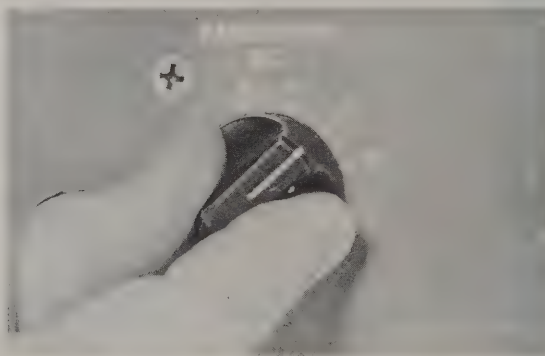
**2** Turn the LINE GAIN control to 0.



**5** Turn the BFO switch to OFF.



**3** Turn the RF GAIN control to 10.



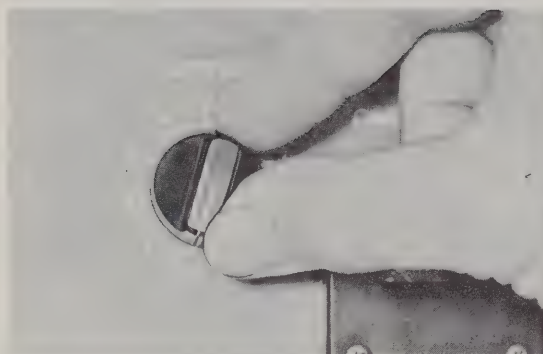
**6** Set the BANDWIDTH switch to 8 kc.

TM5820-357-10-9①

*Figure 9. Reception of voice signals (part 1 of 4).*



**7** Turn the AUDIO RESPONSE switch to MED.



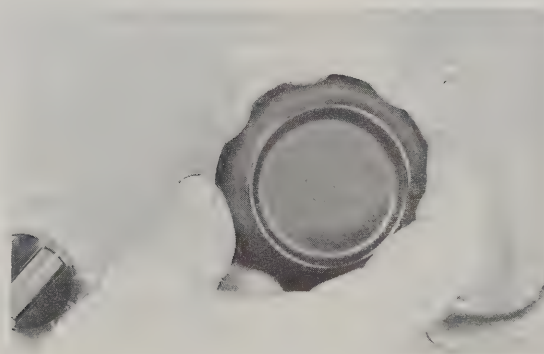
**9** Turn the LIMITER control to OFF.



**8** Turn the AGC switch to MED.



**10** Disengage the DIAL LOCK control by turning fully counterclockwise.

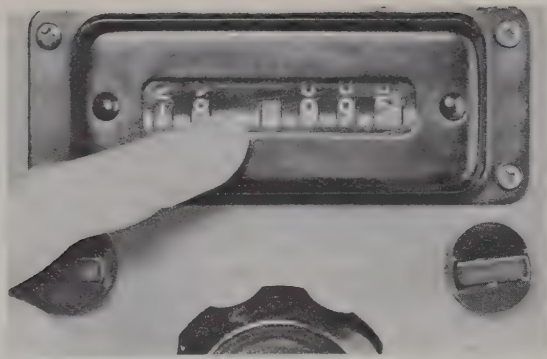


**11** With the MEGACYCLE CHANGE control, select the correct band for the frequency desired.

TM 5820-357-10-9 (2)

*Figure 9. Reception of voice signals (part 2 of 4).*





**12** With the KILOCYCLE CHANGE control, set frequency reading indicator to frequency of desired station.

(To maintain tuning accuracy of at least 3 kc, calibrate the dial as directed in paragraph 13 each time the MEGACYCLE CHANGE control is operated to select another band.)



**13** Adjust the KILOCYCLE CHANGE (see step 12) and ANT TRIM controls for maximum reading on the CARRIER LEVEL meter.

**14** Tighten the DIAL LOCK control by turning fully clockwise (see step 10) to prevent changing of frequency setting.

**15** Adjust the LOCAL GAIN control (see step 4) for the desired sound level.

**16** If noise is excessive, rotate the LIMITER control (see step 9) clockwise as needed.



**17** If interference is encountered, set the BANDWIDTH switch to the 4-kc position or, if necessary, to the 2-kc position.



**18** When the signals fade rapidly, set the AGC switch to FAST.

TM5820-357-10-9③

*Figure 9. Reception of voice signals (part 3 of 4).*

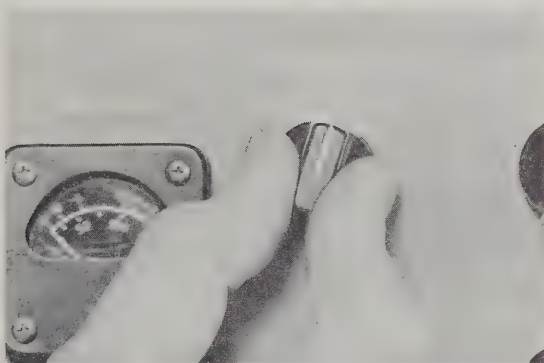


**19** When it is desired to quiet the receiver between transmissions, set the FUNCTION switch to SQUELCH.

(Avoid reducing gain to such an extent that the desired signal is eliminated. Do not use squelch if the desired signals are weak and subject to fading.)



**21** Adjust the LINE GAIN control (see step 2) for the desired reading on the LINE LEVEL meter, normally this reading will be 0 vu.



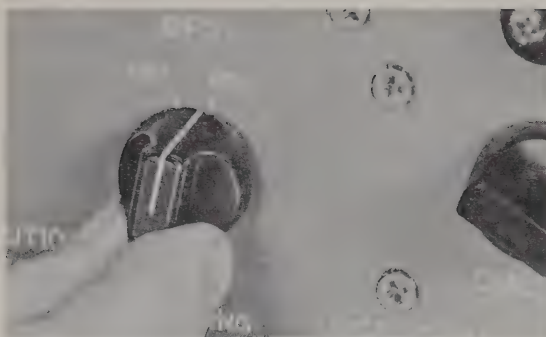
**20** When the balanced-line output is being used to feed a telephone line to a remote location or to another equipment, set the LINE METER switch to the required range.



**22** If the break-in relay is connected to the transmitter control circuits and the receiver is to be disabled during periods of transmission, set the BREAK-IN switch to ON.

TM5820-357-10-9(4)

*Figure 9. Reception of voice signals (part 4 of 4).*



**1** Set the BFO switch to ON.



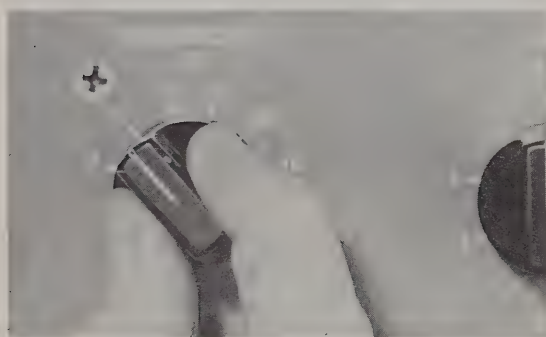
**4** Set the AUDIO RESPONSE switch to SHARP.



**2** Set the BFO PITCH control to zero beat the receiver, and then reset the BFO PITCH control for comfortable pitch.



**5** For manual gain control only, set the FUNCTION switch to MGC.



**3** If interference is encountered, set the BANDWIDTH switch to the .1 kc or the 1 kc position.



**6** Control the sensitivity with the RF GAIN control; maximum sensitivity is obtained at the full clockwise position.

**Note.** Do not use squelch when receiving mcw signals.

TM 5820-357-10-10

*Figure 10. Reception of cw and mcw signals.*



reception of any type signals, turn the FUNCTION switch to the OFF position. The proper stopping procedures are shown in figure 13.

## 18. Antijamming Procedures

When an operator recognizes that his receiver is being jammed, he will promptly inform his immediate superior officer. Under no condition will he cease operating. To provide maximum intelligibility of jammed signals, he will adhere to the operational procedure indicated for each type of operation. When receiving jammed signals, receiving conditions may be improved by performing one or more of the following procedures:

a. Rotate the KILOCYCLE CHANGES control very slowly through several dial mark-

ings on either side of the desired signal; some separation of the signal may be achieved.

b. Set the BANDWIDTH control to a lower number to give narrower bandwidth.

c. Reduce the RF GAIN.

d. For cw or mcw reception, vary the BFO PITCH control.

e. For cw reception, set the AUDIO RESPONSE switch to SHARP.

f. If severe noise is present, use the LIMITER.

g. Reset the FUNCTION switch to MGC (if AGC is being used).

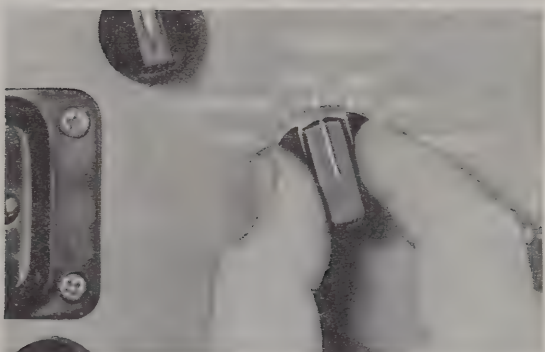
*Note.* When receiving frequency-shift signals, refer to the technical manual covering the receiving system for antijamming procedures.



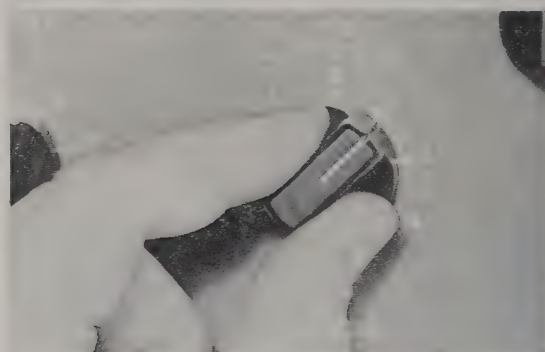
- 1** Turn the BANDWIDTH switch to 2.



- 3** Tune the KILOCYCLE CHANGE control to the desired frequency; then readjust it slightly until mark and space signals with the same tone are heard.



- 2** Turn the FUNCTION switch to AGC.



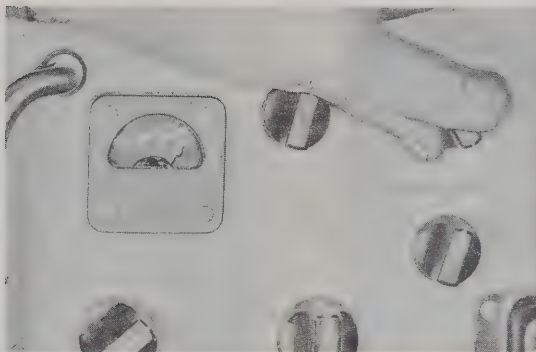
- 4** Adjust the BFO PITCH control until the teletypewriter prints good copy (for further information refer to manual in use for the particular system being used).

TM 5820-357-10-11 (1)

*Figure 11. Reception of frequency shift signals (part 1 of 2).*



**5** Turn the LINE METER switch to 0.



**6** Turn the LINE GAIN control to 10. The LINE LEVEL meter should deflect fully to the right.



**7** Adjust the LIMITER control for a LINE LEVEL meter (see step 5) indication at the VU mark.

TM5820-357-10-11(2)

*Figure 11. Reception of frequency shift signals (part 2 of 2).*

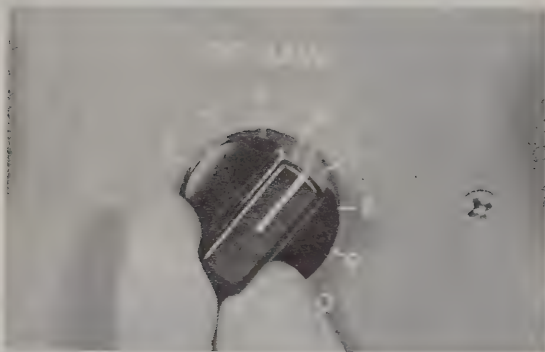




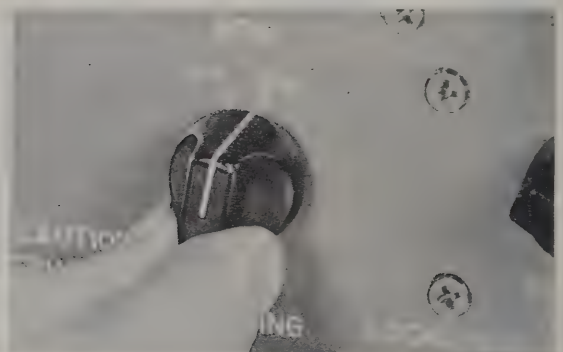
**1** Set the FUNCTION switch to MGC.



**4** Set the BANDWIDTH switch to 2 kc.



**2** Set RF GAIN control to 6.



**5** Turn the BFO switch to ON.



**3** Set the LOCAL GAIN control between 5 and 10.



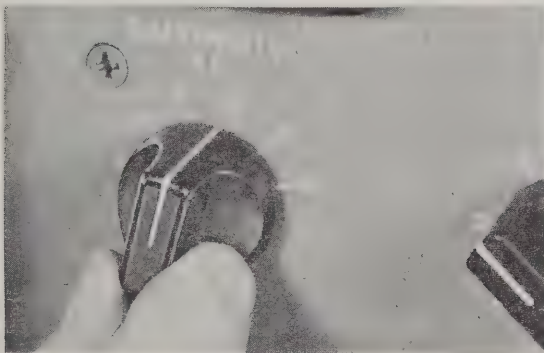
**6** Set the BFO PITCH control to -1 for upper sideband reception or to +1 for lower sideband reception.

TM5820-357-10-12 (1)

*Figure 12. Reception of single-sideband signals (part 1 of 2).*



**7** Tune KILOCYCLE CHANGE control to the frequency of the desired signal; +1 kc if the upper sideband is used and -1 kc if the lower sideband is used.



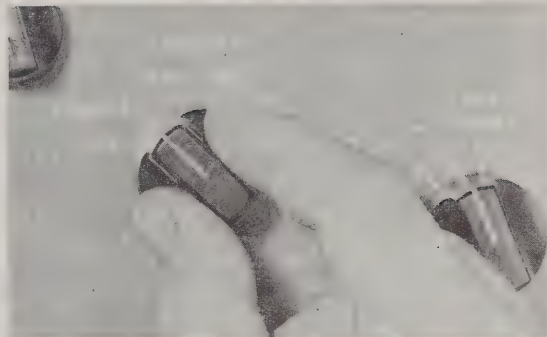
**8** If a BANDWIDTH switch setting of 4 kc is to be used, for example when receiving multi-channel teletype signals, double the -1 or +1 setting (6 and 7 above) to -2 or +2.

**9** Adjust the BFO PITCH (see step 6) and the KILOCYCLE CHANGE controls (see step 7) slightly for the most intelligible signal reception.

**10** Adjust the LOCAL GAIN (see step 3) and the RF GAIN controls (see step 2) for the desired audio level.

M 5820-357-10-12 (2)

Figure 12. Reception of single-sideband signals (part 2 of 2).



**1** If receiver is to be kept in a state of readiness for instant use, set the FUNCTION switch to STAND BY. Do not leave in STAND BY position for more than 30 minutes.



**2** To turn the receiver off, turn the FUNCTION switch to OFF.

TM 5820-357-10-13

Figure 13. Stopping procedure.

LEGEND for marking conditions:

Satisfactory, Y  
Adjustment, Repair or Replacement required, X.  
Defect corrected, (X).

NO.	DAILY ITEM		CONDITION EACH WEEK						2D 3D ECH
			WEEKLY						
			1ST	2D	3D	4TH	8TH		
1.	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT. (Transmitter receiver, scanning receiver, cables, microphones, tubes, spare parts, technical manuals).								
2.	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE HEADSETS, KEYS, JACKS, COMPONENT PANELS. PARA 20b								
3.	INSPECT CONTROLS FOR NORMAL OPERATION. TAP CONTROLS LIGHTLY FOR EVIDENCE OF CUT-OUT FROM LOOSE CONTACTS. PARA 20b								
4.	CHECK FOR NORMAL OPERATION OF EQUIPMENT. BE ALERT FOR UNUSUAL OPERATION OR CONDITION. PARA 22C								
			ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS						CONDITION
5.	CLEAN AND TIGHTEN EXTERIORS OF CASES, RACKS, MOUNTS, TRANSMISSION LINES.	✓							15. INSPECT SETTING OF READILY ACCESSIBLE ELECTRICAL TERMINALS—TUBES, FUSES, CONNECTORS, CONNECTIONS—MOTORS, PLUG-IN HOLES.
6.	INSPECT CASES, MOUNTS, ANTENNA DOWNERS AND EXPOSED METAL SURFACES FOR RUST, CORROSION. PARA 20b	✓							16. INSPECT RELAYS AND SWITCH BREAKERS FOR LOOSE MOTIONS, BAD CONTACTS, MISALIGNMENT OF SHUTTERS AND SPRING-BRADED SPRING TENSION.
7.	INSPECT CORDS, CABLE, WIRE, SHEATHINGS FOR CUTS, KINKS, BREAKS, FRAYING, UNSURROUNDING PROPER TENSION OR DAMAGE. PARA 21d(2)	X							17. INSPECT VARIOUS ELECTRICAL CONNECTIONS FOR BARE, MISALIGNMENT OF PLATES, LOOSE MOUNTING, MOISTURE.
8.	CHECK ANTENNA SWIMMING FOR PROPER TENSION OR DAMAGE.								18. INSPECT RESISTORS, COILS AND INSULATORS FOR CRACKS, CHIPPING, DETERRING MOISTURE, DISCOLORATION.
9.	INSPECT CANNAS AND LEATHER ITEMS FOR WEAR, TEARS, FRAYING.								19. CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, SPOWERS, RELAY CASES AND INTERIORS OF CHASSIS AND ENCLOSURES NOT READILY ACCESSIBLE.
10.	INSPECT ACCESSIBLE ITEMS FOR LOOSENESS, SWITCHES, KNOBS, JACKS, CONNECTORS, RELAYS, TRANSFORMERS, MOTORS, PHOTO LIGHTS, BLOWERS, ETC.	✓							20. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, SPARKS AND BREAKS.
11.	CLEAN AND/OR INSPECT AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS.	✓							21. INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR BARE, CORROSION, LOOSE CONTACTS AND DISCREPANCIES FOR OVERHEATING AND OIL LEAKAGE.
12.	INSPECT STORAGE BATTERIES FOR BARE, LOOSE TERMINALS, SPECIFIC GRAVITY, DAMAGED CASES, IMPROPER BATTERY CONNECTIONS FOR LEAKAGE.								22. INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS AND RESISTORS FOR OVERHEATING AND OIL LEAKAGE.
			ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS						CONDITION
13.	INSPECT SHELF LIFE AND COVERINGS FOR ADEQUACY OF WEATHER PROOFING, TENSILE FRAYING.								23. INSPECT GENERATORS, AMPLIFIERS, DYNAMOS FOR GRIND WEAR, SPRING TENSION, FRAYING AND PUTTING OF COMMUTATOR.
14.	CHECK TERMINAL BOX COVERS FOR CRACKS, BENT, LEAKS, DAMAGED GASKETS, ETC.								24. INSPECT BATTERY RACK TUBES FOR SUNNY GREEN SPOTS.
									25. INSPECT WATERPROOF COVERINGS FOR TEARS, WORN OR LOOSE PARTS.

CONTINUED ON PAGE 4

2

2

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## CHAPTER 3

### MAINTENANCE INSTRUCTIONS

#### 19. Scope of Operator's Maintenance

The following is a list of maintenance duties normally performed by the operator of Radio Receiver R-390/URR. These procedures do not require special tools or test equipment.

- a. Preventive maintenance (para 20).
- b. Visual inspection (para 21).
- c. Operational checklist (para 23).
- d. Replacement of defective fuses.
- e. Receiver calibration (para 12).

#### 20. Preventive Maintenance

a. *DA Form 11-238.* DA Form 11-238 (fig. 14) is a preventive maintenance checklist to be used by the operator. Items not applicable to the receiver are lined out. References in the ITEM block in the figures are to paragraphs that contain additional maintenance information pertinent to the particular item. Instructions for the use of the form appear on the form.

b. *Items.* The information shown in this subparagraph is supplementary to DA Form 11-238. The item numbers correspond to the ITEM numbers on the form.

Item	Maintenance procedures
2	Use a clean cloth to remove dust, dirt, moisture, and grease from the antenna, mast base, microphone, headset, and front panel controls. If necessary, wet the cloth with Cleaning Compound (Federal stock No. 7930-395-9542) and then wipe the parts with a clean dry cloth.
3	All control knobs should work smoothly, be tight on the shaft, and should not bind. Tighten all loose knobs and be sure that the knobs do not rub against the panel.

**Warning:** Cleaning compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

#### 21. Visual Inspection

- a. When the equipment fails to perform

properly, turn the power off and check for the following conditions:

- (1) Wrong setting of switches and controls.
- (2) Headset cord or power cord disconnected.
- (3) Antenna lead-in wire disconnected or antenna broken or grounded.
- (4) Burned-out fuse. (para 22).

b. If the above checks do not locate the trouble, proceed to the operational checklist (para 23).

#### 22. Checking Fuses

Equipment failure is frequently caused by a blown fuse. Spare fuses (2-, and 3-, and  $\frac{3}{8}$ -ampere) are mounted on the rear panel under a protective cover.

**Caution:** Turn off power when replacing fuses. Fuses of correct values must be used or serious damage to the receiver may result. If the replacement fuse burns out immediately after insertion, do not put another fuse in until the cause of fuse failure has been determined by higher echelon repair.

#### 23. Operational Checklist

a. *General.* The operational checklist will help the operator to locate the trouble quickly. The corrective measures are used to repair this trouble. If the suggested measures do not restore normal equipment performance, troubleshooting is required by a field radio mechanic. Note on the repair tag what corrective measures were taken and how the equipment performed at the time of failure.

b. *Procedure.* Place the set in operation (para 11). After the equipment has had time to warm up, perform the steps given in c below (in the order given). Observe the equipment operation and perform any corrective measures necessary.

c. Checklist.

Action	Normal indication	Corrective measure
FUNCTION switch at AGC.....	Dial lamps light..... Rushing noise or signal heard in headset.	Check power cable and fuses. Check headset cord and plug.
Turn MEGACYCLE CHANGE.....	Proper numbers appear in frequency-indicator window.	Higher echelon repair required.
Turn KILOCYCLE CHANGE control to a desired station.	Desired station is heard.....	Higher echelon repair required.
Adjust ANT TRIM control for a maximum indication of CARRIER LEVEL meter.	A maximum deflection of meter is obtained.	Higher echelon repair required.
Turn BFO switch to ON.....		Higher echelon repair required.
Turn KILOCYCLE CHANGE control.....	A whistle-like tone is heard as each station is tuned in.	Higher echelon repair required.
Turn BFO PITCH control.....	The pitch of the tone changes.....	Higher echelon repair required.
Turn FUNCTION switch to STAND BY.	No noise or signal is heard; dial lamp remains lighted.	Higher echelon repair required.
Turn FUNCTION switch to OFF.....	Dial lamps go out.....	Higher echelon repair required.

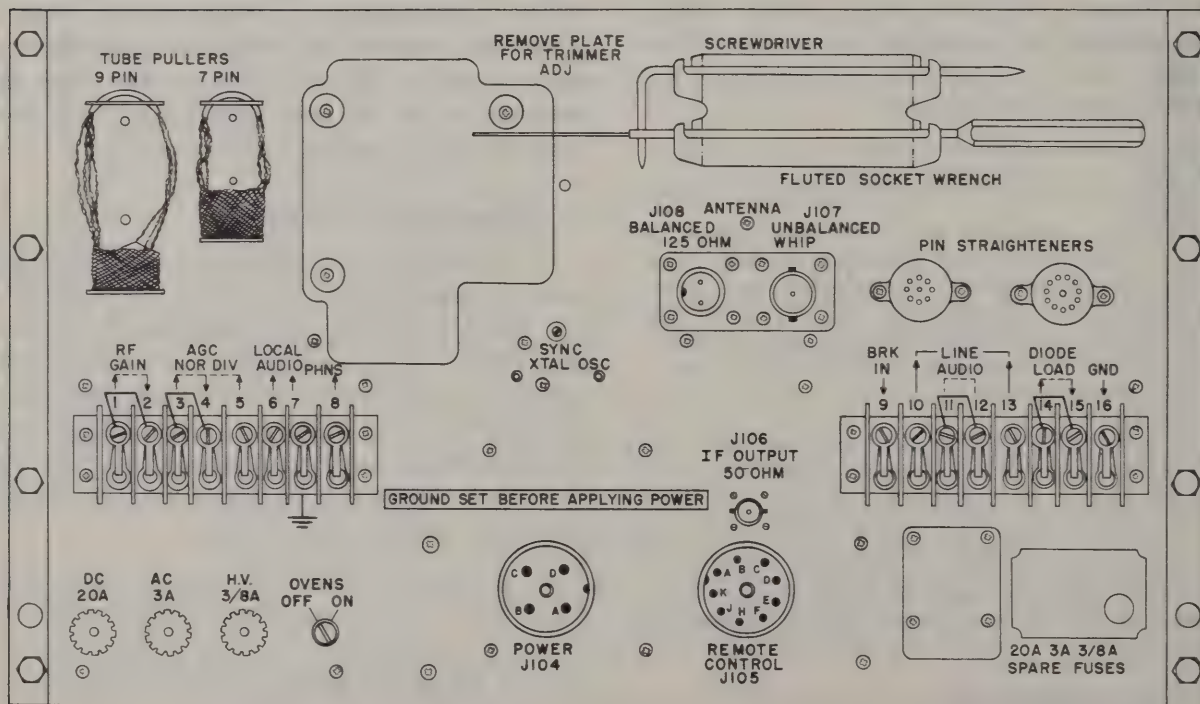


Figure 15. Radio Receiver R-390/URR, back panel.

TM5820-357-10-15

## CHAPTER 4

### DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

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#### 24. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedure outlined in paragraph 25 will be used to prevent further use of the equipment.

#### 25. Methods of Destruction

Use any or all of the methods of destruction given below. The time available will be the major determining factor for the methods used. The tactical situation also will determine in what manner the destruction order will be carried out.

*a. Smash.* Smash tuning indicator, dials, meter, and controls; use sledges, axes, hammers, crowbars, and any other heavy tools available to smash the interior of the set. Use the heaviest tool on hand if time does not permit removing the set from the case.

*b. Cut.* Cut all cords, cables, and wiring in a number of places; use axes, machetes, and similar tools. If time permits, slash the interior wiring and cabling.

*c. Burn.* Burn as much of the equipment as is flammable; use gasoline, oil, flamethrowers, or similar tools. Burn instruction literature first. Pour gasoline on the cut cables and internal wiring and ignite it. Use a flamethrower if available to burn the spare parts or pour gasoline on the spares and ignite it. Use incendiary grenades to complete the destruction of the equipment interiors.

*d. Explode.* Use explosives to complete the demolition or to cause maximum destruction when time does not permit complete demolition by other means; use powder charges, fragmentation grenades or incendiary grenades. Incendiary grenades usually are most effective if destruction of small parts and wiring is desired.

*e. Dispose.* Bury or scatter destroyed parts in slit trenches, foxholes, or throw them into streams.

**Warning:** Make sure that all power is disconnected before attempting any of the above methods of destruction. Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.



## APPENDIX I

### REFERENCES

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Following is a list of references applicable and available to the operator of Radio Receiver R-390/URR.

DA PAM 108-1	Index of Army Motion Pictures, Film Strips, Slides and Photo Recordings.	SR 320-5	Dictionary of United States Army Terms.
DA PAM 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrications Orders, and Modification Work Orders.	SR 320-50	Authorized Abbreviations and Brevity Codes.
FM 21-5	Military Training.	TM 11-649	Radio Receiving Sets AN/FRR-40 and AN/FRR-41.
FM 21-6	Techniques of Military Instruction.	TM 11-5820-357-20P	Organizational Maintenance Repair Parts and Special Tools Lists and Maintenance Allocation Chart: Receiver, Radio R-390/URR.
FM 21-30	Military Symbols.	TM 11-5820-359-12P	Operator and Organizational Maintenance Repair Parts and Special Tools Lists and Maintenance Allocation Chart: Power Supply PP-621/URR.

## APPENDIX II

### BASIC ISSUE ITEMS LIST

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#### Section I. INTRODUCTION

##### 1. Scope

a. This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issue as *part of* the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

b. Columns are as follows:

- (1) *Source, maintenance, and recoverability code.* Not used.
- (2) *Federal stock number.* This column lists the 11-digit Federal stock number.
- (3) *Designation by model.* Not used.
- (4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description on the requisition.
- (5) *Unit of issue.* The unit of issue is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.
- (6) *Expendability.* Expendable items are indicated by the letter X; nonexpendable items are indicated by NX.
- (7) *Quantity authorized.* Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spares and Accessory Items," the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.
- (8) *Illustrations.* Not used.

##### 2. Critical Items

A zero slash ( $\phi$ ) in the "Description" column indicates items that are expected to fail during the first year or items that will make the equipment inoperative if they fail.

# Section II. FUNCTIONAL PARTS LIST

(1) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL	(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPENDABILITY	(7) QUANTITY AUTHORIZED	(8) ILLUSTRATIONS FIGURE NO.	(9) ITEM NO
			ITEMS COMPRISING AN OPERABLE EQUIPMENT					
			RECEIVER, RADIO R-390/URR					
	5820-503-1242		RECEIVER, RADIO R-390/URR	ea	NX			
			TECHNICAL MANUAL TM 11-5820-357-10					
	Order thru AGC		CABLE ASSEMBLY, POWER CX-135B/U; 2 cond No. 18 AWG; 8 ft 1 q	ea	X	2		
	5995-173-8839		POWER SUPPLY PP-621/URR: (Installed in end eqpt)	ea	X	1		
	5820-539-9006			ea	NX			
			RUNNING SPARES AND ACCESSORY ITEMS					
			RECEIVER, RADIO R-390/URR					
	5960-188-3553		Ø ELECTRON TUBE: MIL type 6AJ5	ea	X	1		
	5960-188-3551		Ø ELECTRON TUBE: MIL type 6AK6	ea	X	1		
	5960-188-3602		Ø ELECTRON TUBE: MIL type 6BL6	ea	X	1		
	5960-188-6589		Ø ELECTRON TUBE: MIL type 6BJ6	ea	X	2		
	5960-188-8515		Ø ELECTRON TUBE: MIL type 6C4	ea	X	1		
	5960-262-0167		Ø ELECTRON TUBE: MIL type 12ATTWA	ea	X	1		
	5960-166-7663		Ø ELECTRON TUBE: MIL type 12AU7	ea	X	2		
	5960-167-0389		Ø ELECTRON TUBE: MIL type 5651	ea	X	1		
	5960-264-2089		Ø ELECTRON TUBE: MIL type 5749/6BA6w; (when V701 is replaced sub-assembly must be adjusted)	ea	X	1		
	5960-262-0210		Ø ELECTRON TUBE: MIL type 5814A; (when changing tubes, V901 and V902 should be changed at same time)	ea	X	1		
	5960-264-1486		Ø ELECTRON TUBE: type 60R2 per BUSIIPS Spec	ea	X	1		
	5920-131-9821		Ø FUSE, CARTRIDGE: 3 amp; 125V; Littlefuse No. 313003	ea	X	6		
	5920-537-6647		Ø FUSE, CARTRIDGE: 3/8 amp; 250V; MIL type F02GR375B	ea	X	5		
	6240-155-7836		Ø LAMP, INCANDESCENT: 28v; 0.04 amp; Fed Spec No. W-L-111b, trade No. 327	ea	X	1		
	5905-502-4840		Ø RESISTOR, CURRENT REGULATING: MIL type T1311M01	ea	X	1		



By Order of *Wilber M. Brucker*, Secretary of the Army:

G. H. DECKER,  
*General, United States Army,*  
*Chief of Staff.*

Official:

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To be distributed in accordance with DA Form 12-7 requirements for TM 11 Series (Uncl) plus the following formula:

USASA (2)	11-57
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CSigO (18)	11-98
DASA (5)	11-117
US ARADCOM (2)	11-155
US ARADCOM Rgn (2)	11-500 (AA-AE) (4)
MDW (1)	11-557
Seventh US Army (2)	11-587
EUSA (2)	11-592
Units org under fol TOE (2 cy ea	11-597
except as inde):	32-51
11-7	32-56
11-16	32-57
11-32	

**NG:** State AG (3); Units—Same as Active Army except allowance is one copy to each unit.

**USAR:** None.

For explanation of abbreviations used, see AR 320-50.



# TECHNICAL MANUAL

## RADIO RECEIVING SET AN/FRR-39

TM 11-648

CHANGE NO. 3

 HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 20 September 1963

TM 11-648, 23 November 1954, is changed as follows:

The parenthetical reference to previous changes (example "page 1 of C 2") indicates that pertinent material was published in that changes.

*Page 3.* Add paragraph 1.1 after paragraph 1.

### 1.1. Index of Publications

(Added)

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment. DA Pam 310-4 is a current index of technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes and revisions of each equipment publication.

Delete paragraph 2 (page 1 of C 2) and substitute:

### 2. Forms and Records

(Superseded)

*a. Reports of Maintenance and Unsatisfactory Equipment.* Use equipment forms and records in accordance with instructions in TM 38-750.

*b. Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as pre-

scribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

*c. Reporting of Equipment Manual Improvements.* The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to: Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N.J. 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

*Page 40.* Add the following note after the chapter heading:

*Note.* Operator's maintenance is not required on Radio Receiving Set AN/FRR-39. Operator's preventive maintenance checks and services for Radio Receiver R-390/URR is contained in TM 11-5820-357-10. Operator's preventive maintenance checks and services for Receiver Control C-957/URR is contained in TM 11-5080.

Delete section I and substitute:



## Section I. GENERAL

### 42. Scope of Organizational Maintenance

*a.* This chapter contains instructions covering organizational maintenance of Radio Receiving Set AN/FRR-39. It includes instructions for performing preventive and periodic maintenance services, and troubleshooting to be accomplished by the organizational repairman.

*b.* Second echelon maintenance of Radio Receiving Set AN/FRR-39 includes —

- (1) Preventive maintenance (par. 44 through 46).
- (2) Cleaning (par. 47).
- (3) Troubleshooting (par. 53).

### 43. Tools, Materials, and Test Equipment Required

The tools, materials, and test equipment required for organizational maintenance are listed below.

*a. Tools.*

- (1) Tool Kit, Radar and Radio Repairman TK-87/U.

- (2) Tool Kit, Radar and Radio Repairman TK-88/U.

*b. Materials.*

- (1) Cleaning compound (Federal stock No. 7930-395-9542).
- (2) Cleaning cloth.
- (3) Fine sandpaper.

*c. Test Equipment.*

- (1) Multimeter TS-352/U.
- (2) Test Set, Electron Tube TV-7/U.
- (3) Audio Oscillator TS-382/U.
- (4) Multimeter ME-30/U.
- (5) RF Signal Generator AN/URM-25.
- (6) Transformer CN-16/U.
- (7) Oscilloscope OS-8A/U.
- (8) Multimeter ME-26/U.
- (9) Frequency Meter AN/URM-32.

Delete section II and substitute:

## Section II. PREVENTIVE MAINTENANCE SERVICES

### 44. Preventive Maintenance

*a.* Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspections and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of Radio Receiving Set AN/FRR-39 at the second echelon level are made at quarterly intervals unless otherwise directed by the commanding officer.

*b.* Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

### 45. Quarterly Maintenance

Quarterly preventive maintenance checks and services on Radio Receiving Set AN/FRR-39 are required. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (par. 46) in the sequence listed.

## 46. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Completeness .....	Inspect the AN/FRR-39 for the presence of all units and accessory items.	App. III.
2	Installation .....	Inspect the AN/FRR-39 for proper installation.	Par. 17 and 18.
3	Cables .....	Clean, check, and tighten the cable connections. Inspect cables for cuts, breaks, deterioration, kinks, and strains.	Fig. 10.
4	Exterior surfaces ...	Clean the exterior surfaces of the units comprising the AN/FRR-39. Inspect the cabinet for rust and corrosion.	Par. 47.
5	Modifications .....	Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All ROUTINE MWO's must be scheduled.	TM 38-750 and DA Pam 310-4.
6	Spare parts .....	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions.	App. III.
7	Antenna .....	Inspect antenna for eccentricities, loose fit, and damaged insulators. Check antenna guy wires for looseness and proper tension.	None.
8	R-390/URR .....	Perform the quarterly preventive maintenance checks and services as required.	TM 11-5820-357-20.
9	C-975/URR .....	Perform the quarterly preventive maintenance checks and services as required.	TM 11-5080.
10	Equipment performance.	Check for normal operation.	Par. 54.

## 47. Cleaning

Inspect the exterior surfaces of the AN/FRR-39. The exterior surfaces should be clean, and free of dust, dirt, grease, and fungus.

*a.* Remove dust and loose dirt with a clean soft cloth.

**Warning:** Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. *Do not* use near a flame.

*b.* Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound.

*c.* Remove dust or dirt from plugs and jacks with a brush.

**Caution:** Do not press on the meter faces

(glass) when cleaning; the meter may become damaged.

*d.* Clean the front panels, meters, and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used.

*e.* Clean rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of the proper paint on bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-231.

*Pages 41.* Delete figure 27.

*Page 42.* Delete figure 28.

*Page 44.* Delete paragraphs 49 and 50.

*Page 58.* Add appendix I after chapter 7:

## APPENDIX I

### REFERENCES

Following is a list of references available to maintenance personnel of Radio Receiving Set AN/FRR-39.

DA Pamphlet 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TM 9-213	Painting Instructions for Field Use.
TM 11-5080	Receiver Control C-975/URR.
TM 11-5820-357-10	Operator's Manual: Radio, Receiver R-390/URR.
TM 11-5820-357-20	Organizational Maintenance Manual: Radio, Receiver R-390/URR.
TM 11-5820-357-20P	Organizational Maintenance Repair Parts and Special Tools List, and Maintenance Allocation Chart, Receiver, Radio R-390/URR.
TM 11-5820-357-35	Field and Depot Maintenance Manual: Radio, Receiver R-390/URR.
TM 38-750	The Army Equipment Record System and Procedures.

(Page 2 of C 1) *Redesignate* Appendix I Maintenance Allocation as Appendix II.

(Page 6 of C 1) *Redesignate* Appendix II Basic Issue Items List For Radio Receiving Set AN/FRR-39 as Appendix III.



EARLE G. WHEELER,  
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USA CD Agcy (1)  
USCONARC (5)  
USAMC (5)  
ARADCOM (2)  
ARADCOM Rgn (2)  
OS Maj Comd (3)  
OS Base Comd (2)  
LOGCOMD (2)  
USAECOM (5)  
USAMICOM (4)  
USASCC (4)  
MDW (1)  
Armies (2)  
Corps (2)  
USA Corps (3)  
USATC AD (2)  
USATC Engr (2)  
USATC Inf (2)  
USATC Armor (2)  
USASTC (5)  
Instl (2)) except  
    Ft Monmouth (65)  
Svc Colleges (2)  
Br Svc Sch (2) **except**  
GENDEP (OS) (2)  
Sig Dep (OS) (12)  
Sig Sec, GENDEP (5)

Army Dep (2) **except**  
    Ft Worth (8)  
    Lexington (12)  
    Sacramento (28)  
    Tobyhanna (12)  
USA Elct RD Actv, White Sands (13)  
USA Elct RD Actv, Ft Huachuca (2)  
USA Trans Tml Comd (1)  
Army Tml (1)  
POE (1)  
USAOSA (1)  
AMS (1)  
WRAMC (1)  
AFIP (1)  
Army Pic Cen (2)  
USA Mbl Spt Cen (1)  
USA Elct Mat Agcy (12)  
Chicago Proc Dist (1)  
USARCARIB Sig Agcy (1)  
Sig Fld Maint Shop (3)  
Units org under fol TOE  
    (2 cy ea UNOINDC):  
    11-7  
    11-16  
    11-57  
    11-98  
    11-117  
    11-155  
    11-157  
    11-500 AA-AC (4)  
    11-557  
    11-587  
    11-592  
    11-597

NG: None.

USAR: None.

For explanation of abbreviations used see AR 320-50.









# TECHNICAL MANUAL

## RADIO RECEIVING SET AN/FRR-39

TM 11-648

CHANGES No. 2

}

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON 25, D.C., 23 July 1961

TM 11-648, 23 November 1954, is changed as follows:

Page 3, paragraph 2. Make the following changes: Delete subparagraph *f* and substitute:

*f.* Forward DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) direct to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J., with comments on parts listings in appendixes I and II.

Add subparagraph *g* after subparagraph *f*.

*g.* Forward all other comments on this publication direct to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N. J.

### 28. Receiver Control Bfo Frequency Adjustment

With normal operating \* \* \* the bfo frequency:

\* \* \* \*

*h.* (As changed by C 1, 24 Aug 55) Adjust channel B \* \* \* meter reads 0. If it is not convenient to zero the correction meter by adjusting bfo capacitors C1609 and C-1611 (*e* and *g* above), note and log the errors in cps, as indicated by the correction meter, for each of the two channels. Compensate for the error during operation by detuning the radio receiver (par. 32*d*).

*Note.* A steady \* \* \* procedure as above.

### 32. Normal Diversity Operation

\* \* \* \*

*d.* (As superseded by C 1, 24 Aug 55) Press

the channel A AFC DISCHARGE control. Hold it in for 15 seconds and then release it. Tune the receiver from the high side of the desired signal until the correction meter indicates SET (white mark). If the receiver control channels were not zeroed, during the preoperational adjustment of the bfo, but the errors were logged (par 28*h*), tune receiver A until the kilocycle correction meter indicates SET plus the logged error. For instance, if an error of 240 cps was noted, but was not corrected in the channel A bfo output during the preoperational adjustment, tune receiver A until the kilocycle meter indicates 440 cps (a reading of .44). This is 200 cps (the SET mark on the meter) plus the 240 cps bfo error. The bfo error, due to aging of the reactance tube, is compensated by this procedure of detuning the receiver.

\* \* \* \*

### 35. Operating Notes and Precautions

\* \* \* \*

*e.* (As added by C 1, 24 Aug 55) Periodically check the regulated filament voltage of Receiver Control C-975/URR at jack J1577 6.3 V RMS, on the rear of the chassis. Use the procedure outlined in paragraph 23*a* through *d*. This check is of particular importance during the first month of operating the receiver control. It is also advisable to check the B+ voltage at B+ 180 V jack J1569. If the B+ voltage is low, check tubes V1517 through V1522.

Figure 35. (As changed by C 1, 24 Aug 55) The following note is added:

4. IN RECEIVER CONTROL C-975/URR, WITH SERIAL NUMBERS OF 280 AND HIGHER, POTENTIOMETER R1646 IS 100 OHMS.

\*These changes supersede C 1, 24 August 1955, and so much of DA Supply Manual SIG 7 & 8 AN/FRR-39, 24 September 1957, as pertains to first echelon items.

## APPENDIX I (Added)

### MAINTENANCE ALLOCATION

---

#### Section I. INTRODUCTION

##### 1. General

a. This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

- (1) *Part or component.* This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically.
  - (2) *Maintenance functions.* This column indicates the various maintenance functions allocated to the echelon capable of performing the operations.
    - (a) *Service.* To clean, to preserve, and to replenish fuel and lubricants.
    - (b) *Adjust.* To regulate periodically to prevent malfunction.
    - (c) *Inspect.* To verify serviceability and to detect incipient electrical or mechanical failure, by scrutiny.
    - (d) *Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.
    - (e) *Repair.* To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.
    - (f) *Align.* To adjust two or more components of an electrical system so that their functions are properly synchronized.
    - (g) *Calibrate.* To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.
    - (h) *Rebuild.* To restore an item to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications and subsequent reassembly of the item.
  - (3) *1st, 2d, 3d, 4th, 5th echelon.* The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.
  - (4) *Tools required.* This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.
  - (5) *Remarks.* Entries in this column are used to clarify any of the data cited in the preceding columns.
- c. Columns in section III, allocation of tools for maintenance functions chart, are as follows:
- (1) *Tools required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.
  - (2) *2d, 4th, 5th echelon.* The dagger (†) symbol indicates the echelons allocated the facility.



- (3) *Tool code*. This column lists the tool code assigned.

## **2. Mounting Hardware**

The basic entries of the maintenance allocation chart do not include mounting hardware such as screws, nuts, bolts, washers, brackets, clamps, etc.

## **3. Maintenance by Using Organizations**

When this equipment is used by signal services organizations organic to theater headquarters or communications zones to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

## Section II. MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH.	(5) 3RD ECH.	(6) 4TH ECH.	(7) 5TH ECH.	(8) TOOLS REQUIRED	(9) REMARKS
RECEIVING SET RADIO AN/FRR-39	service	X					1, 3	Operative check Preventive Maintenance
	adjust	X						
	inspect	X						
	replace	X						
	repair	X		X				
	align	X						
CONTROL RECEIVER C-975/URR	calibrate				X		1, 2, 7, 8, 9, 11, 12, 13, 14	Operative check Preventive Maintenance
	rebuild					X	1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14	
							1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	
	replace	X		X		X		
	repair							
	rebuild							
CABINET ELECTRICAL EQUIPMENT C-47111PIU	replace	X		X		X		Operative check Preventive Maintenance
	repair							
	rebuild							
	replace	X		X		X		
	repair							
	rebuild							

### Section III. ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH.	2ND ECH.	3RD ECH.	4TH ECH.	5TH ECH.	TOOL CODE	REMARKS
AN/FRR-39 (continued)							
TOOL EQUIPMENT TK-87		†		†	†	1	
MULTIMETER TS-352/U			†		†	2	
TEST SET, ELECTRON TUBE TV-7/U		†		†		3	
TOOL SET, ELECTRON TUBE TV-2/U					†	4	
AUDIO OSCILLATOR TS-382/U				†	†	5	
SPECTRUM ANALYZER TS-723/U				†	†	6	
TOOL EQUIPMENT TK-88		†		†	†	7	
MULTIMETER ME-30/U		†		†	†	8	
RF SIGNAL GENERATOR AN/URM-25		†		†	†	9	
FREQUENCY METER FR-67/U				†	†	10	
TRANSFORMER CN-16/U		†		†	†	11	
OSCILLOSCOPE OS-8A/U		†		†	†	12	
MULTIMETER ME-26/U		†		†	†	13	
FREQUENCY METER AN/URM-32		†		†	†	14	



## APPENDIX II (Added)

### BASIC ISSUE ITEMS LIST FOR RADIO RECEIVING SET AN/FRR-39

---

#### Section I. INTRODUCTION

##### 1. General

a. This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

b. Columns are as follows:

- (1) *Source, maintenance, and recoverability code.* Not used.
- (2) *Federal stock number.* This column lists the 11-digit Federal stock number.
- (3) *Designation by model.* Not used.
- (4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.
- (5) *Unit of issue.* The unit of issue is the supply term by which the individual item is counted for procurement, stor-

age, requisitioning, allowances, and issue purposes.

- (6) *Expendability.* Expendable items are indicated by the letter X; nonexpendable items are indicated by NX.
- (7) *Quantity authorized.* Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spares and Accessory Items", the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.
- (8) *Illustration.* The "Item No." column lists the reference symbol used for identification of the items in the illustration or text of the manual.

##### 2. References

Additional instructions concerning maintenance of this equipment are contained in:

TM 11-5820-357-10, Operator's Manual for Receiver, Radio R-390/URR. DA Supply manual SIG 7 & 8, C-975/URR.

# Section II. FUNCTIONAL PARTS LIST

(1) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL	(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPENDABILITY	(7) QUANTITY AUTHORIZED	(8) ILLUSTRATIONS FIGURE NO	(9) ITEM NO
			ITEMS COMPRISING AN OPERABLE EQUIPMENT					
			RECEIVING SET RADIO AN/FRR-39					
	5820-503-1515		RECEIVING SET, RADIO AN/FRR-39	ea	NX			
	Ord thru ASC		TECHNICAL MANUAL: TM 11-648	ea	X	2		
	5820-503-0801		CABINET, ELECTRICAL EQUIPMENT CV-1119/U	ea	NX	1		
	5820-503-0891		CONTROL, RECEIVER C-975 URR	ea	NX	1		
	5820-310-2236		INSTALLATION KIT, ELECTRICAL EQUIPMENT MK-395 FRR: (Note: This kit loses its identity once installed)	ea	X	1		
	5820-503-1242		RECEIVER, RADIO R-390/URR	ea	NX	1		
			INSTALLATION KIT, ELECTRONIC EQUIPMENT MK-395 FRR					
	5935-201-2410		ADAPTER, CONNECTOR UG-971 U: SigC dwg No. SC-C-106728	ea	X	2		
	5305-012-1887		BOLT, MACHINE: steel; cod pl; 1/4-20 UNC 2A thd; 3/4 in lg; MIL MS-35291-6	ea	X	14		
	5815-395-8945		BRACKET: interconnecting box; step shape; Collins Rad part/dwg 506 7051 002	ea	X	1		
	5815-395-8943		BRACKET: pressed rack support; L shape; incl hdwe; Collins Rad part/dwg 506-3441 003	ea	X	1		
	5995-281-0807		CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL CX-2752/U: SigC dwg SM-C-170448	ea	X	1		
	5995-173-8969		CABLE ASSEMBLY, POWER, ELECTRICAL CX-2806/U	ea	X	1		
	5340-285-7720		CLAMP, LOOP: aluminum; designed to accom mat'l 1/2 in dia; Tinnerman Prod part A-3044-4-92	ea	X	3		
	5935-660-4302		CONNECTOR, PLUG, ELECTRICAL UG-573B/U	ea	X	2		
	5920-240-4114		FUSE, PLUG: 10 amp 125 v; MIL type F14D10R0A	ea	X	2		F1801
	5995-257-6163		LEAD, ELECTRICAL: 3/8 in tinned copper braid; 6 in lg; 7/32 in dia hole ea end; SigC dwg No. SM-B-178462	ea	X	2		
	5821-509-0953		LEAD, ELECTRICAL: 3/8 in tinned copper braid; 16 in lg; 3/8 in tinned copper braid; 16 in lg; Mon Elec part ME-B-648-4A	ea	X	1		
	5310-208-1971		NUT, PLAIN, SQUARE: steel; cad pl; 1/4-20 UNC-2B thd; Spec FF-B-571 type B Style 2	ea	X	26		
	5820-503-1173		PANEL, BLANK: aluminum; gray E finish; BuShips dwg RE23F225 Size A	ea	X	1		
	5820-506-8620		PANEL, BLANK: aluminum; gray E finish; BuShips dwg RE23F225 Size C	ea	X	1		
	5820-503-1173		PANEL, BLANK: aluminum gray E finish; BuShips dwg REL3F225 Size F	ea	X	1		
	5820-141-2979		PLATE, IDENTIFICATION: aluminum; inscribed Radio Set AN/FRR-39; SigC dwg SC-D-17269-3	ea	X	1		

(1) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(2) FEDERAL STOCK NUMBER	(3) DESIGNATION BY MODEL	(4) DESCRIPTION	(5) UNIT OF ISSUE	(6) EXPENDABILITY	(7) QUANTITY AUTHORIZED	(8) ILLUSTRATIONS FIGURE NO	(9) ITEM NO
			AN/FRR-39 (continued)					
	5820-205-1046		PLATE, INSTRUCTION: aluminum, inscribed "Caution: Read Instruction's Packed With Equipment Before Using." SigC dwg No. SC-D-17269-1	ea	X	1		
	5305-506-8709		SCREW, MACHINE: steel; cad pl; pan head; slotted dr; 2-36 NC thd 3/16 in lg; MIL MS 35223-2	ea	X	8		
	5305-550-9346		SCREW, MACHINE: brass; plain; pan head; slotted dr; 6-32 NC thd 3/8 in lg; MIL MS-35229-28	ea	X	12		
	5305-506-8738		SCREW, MACHINE: brass; pan head; 10-32 NF thd; 3/8 in lg; MIL MS-35230-61	ea	X	3		
	5305-506-8743		SCREW, MACHINE: Steel; cad pl; pan head; slotted dr; 1/4-20 UNC thd 5/8 in lg; MIL MS 35223-80	ea	X	12		
	5310-595-5974		WASHER, FLAT: rd; light; cad pl; 1/4 in id x 5/8 in od; Spec FF-W-92 type A Class A Grade 1	ea	X	26		
	5310-209-3979		WASHER, LOCK: med; steel; cad pl; split helical; 1/4 in nom bolt size; MIL MS-35338-44	ea	X	26		
			RUNNING SPARES AND ACCESSORY ITEMS					
			RECEIVING SET RADIO AN/FRR-39					
			INSTALLATION KIT ELECTRONIC EQUIPMENT MK-395/FRR					
	5935-201-2410		ADAPTER, CONNECTOR UG-971/U: SigC dwg No. SC-C-106728	ea	X	1		
	5935-660-4302		CONNECTOR, PLUG, ELECTRICAL UG-573B/U	ea	X	1		
	5920-240-4114		FUSE, PLUG: 10 amp 125 v; MIL type F14D10ROA	ea	X	5		

BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,  
*General, United States Army,*  
*Chief of Staff.*

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R. V. LEE,  
*Major General, United States Army,*  
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USAABELCTBD (1)  
USAAVNBD (1)  
USAAATBD (1)  
ARADCOM (2)  
ARADCOM Rgn (2)  
OS Maj Comd (2)  
OS Base Comd (2)  
LOGCOMD (2)  
MDW (1)  
Armies (2)  
Corps (5)  
USATC AD (2)  
USATC Armor (2)  
USATC Engr (2)  
USATC FA (2)  
USATC Inf (2)  
Svc Colleges (2)  
Br Svc Sch (2)  
GENDEP (2) except  
    Atlanta GENDEP (None)  
Sig Sec, GENDEP (5)  
Sig Dep (12)  
Ft Monmouth (75)  
AFIP (1)  
WRAMC (1)

AFSSC (1)  
USAEFG (2)  
EMC (1)  
USACA (2)  
USASEA (1)  
USA Caribbean Sig Agcy (1)  
USA Sig Msl Spt Agcy (12)  
USASSA (20)  
USASSAMRO (1)  
Army Pictorial Cen (2)  
USAOMC (3)  
USA Trans Tml Comd (1)  
Army Tml (1)  
POE (1)  
OSA (1)  
AMS (1)  
Sig Fld Maint Shops (2)  
JBUSMC (2)  
Units org under fol TOE:  
Two copies to each unless  
    otherwise indicated:  
11-7  
11-15  
11-16  
11-18  
11-57  
11-95  
11-97  
11-117  
11-155  
11-500 (AA-AE) (4)  
11-557  
11-587  
11-592  
11-597

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.









# CHAPTER 1

## INTRODUCTION

---

### Section I. GENERAL

#### 1. Scope

*a.* This manual contains instructions for the installation, operation, maintenance, and repair of Radio Receiving Set AN/FRR-39.

*b.* In addition to the installation kit, Radio Receiving Set AN/FRR-39 includes two Radio Receivers R-390/URR, a Receiver Control C-975/URR, and an Electrical Equipment Cabinet CY-1119/U. Maintenance and repair of these equipments are covered in the technical manuals for these units.

#### 2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army equipment and in performing preventive maintenance.

*a.* DD Form 6 (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in SR 745-45-5 (Army); Navy Shipping Guide, Article 1850-4 (Navy); and AFR 71-4 (Air Force).

*b.* DA Form 468 (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

*c.* DD Form 535 (Unsatisfactory Report) will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

*d.* DA Form 11-238 (Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar)) will be prepared in accordance with instructions on the back of the form.

*e.* DA Form 11-239 (Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar)) will be prepared in accordance with instructions on the back of the form.

*f.* Use other forms and records as authorized.

### Section II. DESCRIPTION AND DATA

#### 3. Purpose

*a.* Radio Receiving Set AN/FRR-39 provides diversity reception of frequency-shift keyed teletypewriter signals within the frequency range of 0.5 to 32 megacycles (mc). The equipment is normally used to operate Radioteletype Terminal Equipment AN/FGC-1( ). Circuits are provided in Receiver Control C-975/URR to maintain automatic frequency control of the audio signals developed by the radio receiving set. The receiving set may be used to receive either single-channel or time-division multiplex signals.

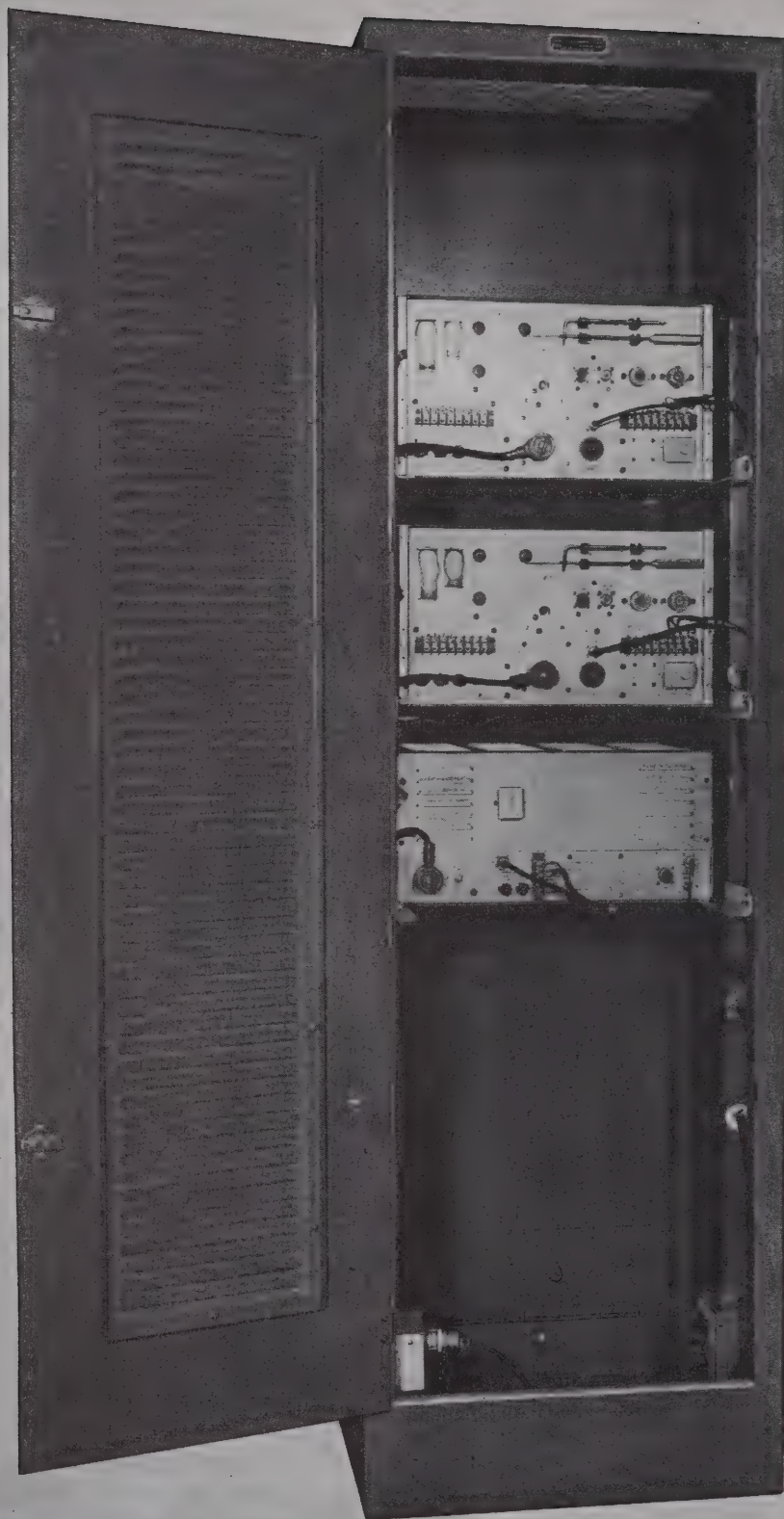
*b.* Two Radio Receivers R-390/URR are mounted with Receiver Control C-975/URR in Electrical Equipment Cabinet CY-1119/U. A complete list of components is given in paragraph

7. The operating components set up for normal operation are shown in figures 1 and 2.

#### 4. System Application

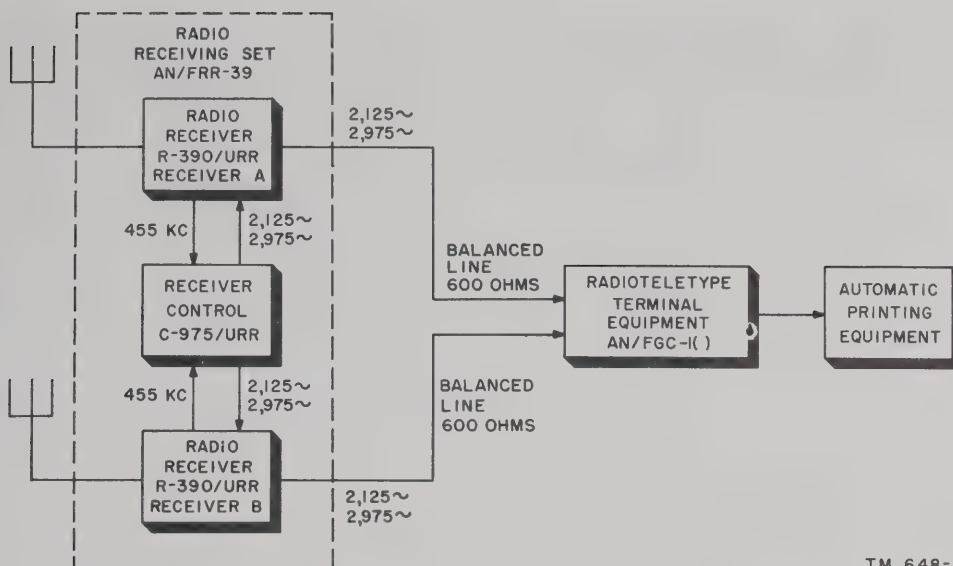
A block diagram of a radioteletype system, in which Radio Receiving Set AN/FRR-39 is used with Radioteletype Terminal Equipment AN/FGC-1( ) is shown in figure 3. The radio transmitter sends out its normal frequency when the contacts of teletypewriter-sending mechanism are closed (mark condition). When the contacts are open (space condition), the radio frequency (rf) carrier is reduced 850 cycles per second (cps) in frequency; the amplitude remains unchanged. The doublet or rhombic antennas feed the incoming frequency-shift signals to the receiver, where





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*Figure 2. Radio Receiving Set AN/FRR-39, rear view.*



TM 648-4

Figure 3. Radio Receiving Set AN/FRR-39, system application.

the carrier frequency is converted to a 455-kilo-cycle (kc) intermediate frequency (if.). The if. signal, taken from the if. output circuit of each receiver, is then fed to each channel of Receiver Control C-975/URR. Receiver Control C-975/URR converts the if. signal to audio frequencies (af) of 2,125 cps for mark signals and 2,975 cps for space signals. It also provides automatic frequency control (afc) of the audio signals. The audio signals are then fed back to each receiver. Output signals, taken from the line audio outputs of Radio Receivers R-390/URR, are applied to Radioteletype Terminal Equipment AN/FGC-1( ), which provides diversity combining and produces direct-current (dc) pulses for operation of teletypewriter equipment.

## 5. Technical Characteristics

### a. Radio Receiver R-390/URR.

Type of circuit.....	Triple-conversion super-heterodyne on eight lowest frequency bands; double-conversion super-heterodyne on all other bands.
Frequency range.....	.5 mc to 32 mc (in 32 steps).
Types of signals received..	A1—cw, A2—mcw, A3—voice, F1—frequency-shift keying.
Type of tuning.....	Continuous; frequency read directly on counter-type indicator.
Method of calibration.....	Built-in crystal-controlled calibration oscillator.
Calibration points.....	Every 100 kc.

### Audio power output:

600-ohm unbalanced line.....	500 mw.
600-ohm balanced line..	10 mw.
Headphones .....	5 mw.
If. selectivity bandwidth..	100 cps to 16 kc in 6 steps.
If. frequencies:	
First variable if. (used on eight lowest frequency bands).....	9 to 18 mc.
Second variable if. (all bands).....	2 to 2.5 mc on lowest step; 2 to 3 mc on all other steps.
Third (fixed) if. ....	455 kc.

### Sensitivity:

Am. signals.....	3 uv or better.
Cw signals.....	1 uv or better.
If. output (3 uv input to receiver).....	minimum of 20 millivolts.
Power source.....	115 or 230-volts ac $\pm 10\%$ , 48-62 cps through Power Supply PP-621/URR.

### Power input 115 or 230 volts

ac .....	270 watts total, 170 watts with oven heaters off.
----------	---

### Number of tubes..... 33 (including ballast tube RT-512).

### Antennas:

Unbalanced.....	Random length vehicular-mounted whip or straight-wire.
Balanced .....	125-ohm nominal terminating impedance; matches 70- to 200-ohm lines or unbalanced transmission lines using adapters.
Weight.....	80 lb (including Power Supply PP-621/URR).

## b. Receiver Control C-975/URR.

Input frequency-----	455 kc.
Nominal output frequency----	2,125 cps.
Nominal input voltage for afc action-----	20 mv.
Range for afc action-----	2,125 cps, +1 kc, -.5 kc.
Number of tubes-----	35.
Input impedance-----	50 ohms.
Power supply voltage-----	115 or 230 volts ac, 48-62 cps, single phase.
Power requirements-----	135 watts.
Weight-----	48 pounds.

## 6. Packaging Data

a. *Packaging of Electrical Equipment Cabinet CY-1119/U.* When packaged for either export or domestic shipment, Electrical Equipment Cabinet CY-1119/U is wrapped in a paper barrier and placed in a wooden crate. A cloth bag containing the screws and washers used to mount the various component units in the cabinet is tied to the cabinet. The complete package is approximately 80 inches high by 23 inches wide by 22 inches deep, giving an approximate volume of 23.4 cubic feet. A cutaway view of the cabinet packed for shipment is shown in figure 13.

b. *Packaging of Component Units of Radio*

*Receiving Set AN/FRR-39.* When packed for export shipment, the component units of Radio Receiving Set AN/FRR-39 are wrapped in paper and placed in an inner corrugated fiberboard carton. Each component is wrapped and packed separately. Cleated wooden spacers hold the units securely within their cartons, and prevent damage to the controls and connectors on the front and back panels. Silica gel containers and a package containing the cable assemblies shipped with the units are stored in the space between the back panel of each unit and the rear wooden spacer. The inner corrugated fiberboard container is inclosed in a sealed, moisture-vaporproof barrier, and placed in an outer, tight-fitting corrugated cardboard carton. The technical manuals and running spares are in separate packages taped to the top of the outer carton. This outer carton is sealed with tape, placed in a wooden crate containing excelsior, and secured with steel straps. Each complete package is approximately 20 inches high by 32 inches wide by 27 inches long, giving it a volume of approximately 10 cubic feet. An exploded view of the packaging of a receiver or receiver control is shown in figure 13.

*Note.* Items may be packaged in a manner different from that shown, depending on the supply channel.

## 7. Table of Components

Component	Required Number	Height (in.)	Depth (in.)	Width (in.)	Volume (cu ft)	Unit weight (lb)	Length (in.)
Electrical Equipment Cabinet CY-1119/U-----	1	78½	20 <sup>13</sup> / <sub>16</sub>	21½	20.7	165	-----
Radio Receiver R-390/URR-----	2	10½	17¼	19	2.0	80	-----
Receiver Control C-975/URR-----	1	8¾	16½	19	1.59	48	-----
Power Cable Assembly CX-1358/U-----	3						96
Cord CG-409C/U-----	2						54
Electrical Special Purpose Cable Assembly CX-2753/U-----	2						53
Electrical Power Cable Assembly CX-2806/U-----	1						63½
Electrical Special Purpose Cable Assembly CX-2752/U-----	2						180
Hardware and angle brackets-----	1 set						-----
Running spares (with each component)-----	1 set						-----
Technical manuals (with each component)-----	2						-----
Total-----					24.29	273	-----

## 8. Description of Radio Receiving Set AN/FRR-39

(figs. 1 and 2)

a. *General.* Radio Receiving Set AN/FRR-39 is designed for diversity reception of radiotele-

type signals. Included in the system is provision for automatic frequency control of the audio signals developed in the radio receiving set for supplying control signals to the associated teletypewriter equipment. Mounted in Electrical Cabinet CY-1119/U are two Radio Receivers



R-390/URR and a Receiver Control C-975/URR. All the cables necessary for operation of the radio receiving set are included as part of each individual unit or as part of the installation kit for Radio Receiving Set AN/FRR-39.

*b. Installation Kit.* An installation kit is shipped as part of the radio receiving set. The kit includes all hardware for mounting the various components of the set, miscellaneous components necessary to complete the cabinet installation, cables not included as part of the individual units, three Adapter Connectors UG-971/U, three Plug Connectors UG-573/U, and fuses for the main alternating-current (ac) line. These items are listed on the installation diagrams (figs. 14 and 15).

## 9. Description of Radio Receiver R-390/URR (figs. 4 and 5)

*a. Radio Receiver R-390/URR* is a 33-tube superheterodyne receiver designed for reception of continuous-wave (cw), modulated continuous-wave (mcw), voice, and radioteletype signals within a frequency range of 0.5 to 32 mc. The

receiver is mounted in a standard 19-inch rack, such as Electrical Equipment Cabinet CY-1119/U. The structural parts of the receiver are aluminum.

*b. All operating controls* are located on the front panel (fig. 23), which has a gray semigloss finish. There are two handles at the outer edges of the panel to facilitate withdrawal of the receiver from the rack or case. The two large knobs at the bottom of the panel, marked MEGACYCLE CHANGE and KILOCYCLE CHANGE, are used for tuning the receiver to the desired frequency. Above the KILOCYCLE CHANGE knob is a counter-type frequency indicator. Numbers shown indicate the frequency in kilocycles. The two left-hand number wheels of the frequency indicator are operated by the MEGACYCLE CHANGE control; the three right-hand number wheels are operated by the KILOCYCLE CHANGE control. In the upper left-hand corner of the front panel is a meter that indicates the level in volume units (vu) of the receiver line audio output. The carrier-level meter, in the upper right-hand corner of the panel, indicates



Figure 4. Radio Receiver R-390/URR, front view.



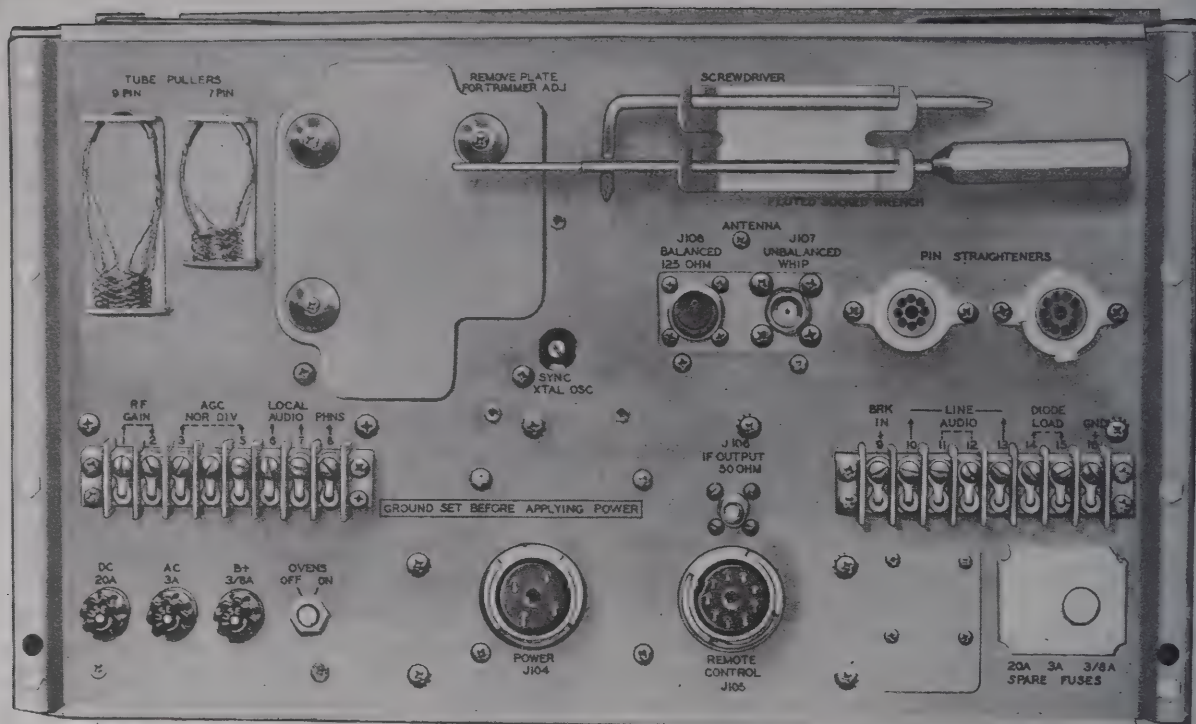


Figure 5. Radio Receiver R-390/URR, rear view.

the relative strength of incoming signal and signal peaks. Distributed about the panel are 15 bar knobs that control the various functions of the receiver. These controls include the LINE METER off-on and range switch, LINE GAIN control, AGC time-constant switch, LIMITER off-on switch and threshold control, AUDIO RESPONSE selector switch, BREAK IN circuit OFF-ON switch, BANDWIDTH selector switch, BFO PITCH control, FUNCTION switch, ANT. TRIM (antenna trimmer) control, BFO OFF-ON switch, kilocycle control DIAL LOCK, ZERO ADJ. frequency-indicator zero-adjustment, LOCAL GAIN control, and RF GAIN control. The PHONES jack in the lower left-hand corner of the panel provides a connection for headphones to the receiver local audio output.

c. On the back panel of the receiver (fig. 24) are mounted special tools, antenna input connectors, operating and spare fuses, POWER and REMOTE CONTROL connectors, an IF OUTPUT connector, an OVENS OFF-ON control, terminal strips for connection of external circuits, and under a protective cover trimmer adjustments for the crystal oscillators.

d. Radio Receiver R-390/URR is comprised of a number of subassemblies, including the main frame and seven removable subchassis. The rf, if, and crystal-oscillator subchassis are mounted on the upper deck of the main frame. Mounted in three compartments on the lower deck are the variable-frequency oscillator (vfo), af, and calibration-oscillator subchassis, and Power Supply PP-621/URR (ac power supply). The subchassis are electrically connected to the main frame or to each other by cables terminating in locking-type connectors. Mounted on the rf subchassis are the gears, camshafts, and racks of the mechanical tuning system.

## 10. Description of Receiver Control C-975/URR

(figs. 6 and 7)

a. Receiver Control C-975/URR is a 35-tube unit that provides an afc circuit to correct for transmitter or receiver drift in radioteletype systems. The equipment consists of a front panel and chassis constructed for rack mounting. All operating controls are located on the front panel. The panel also contains two handles to facilitate re-

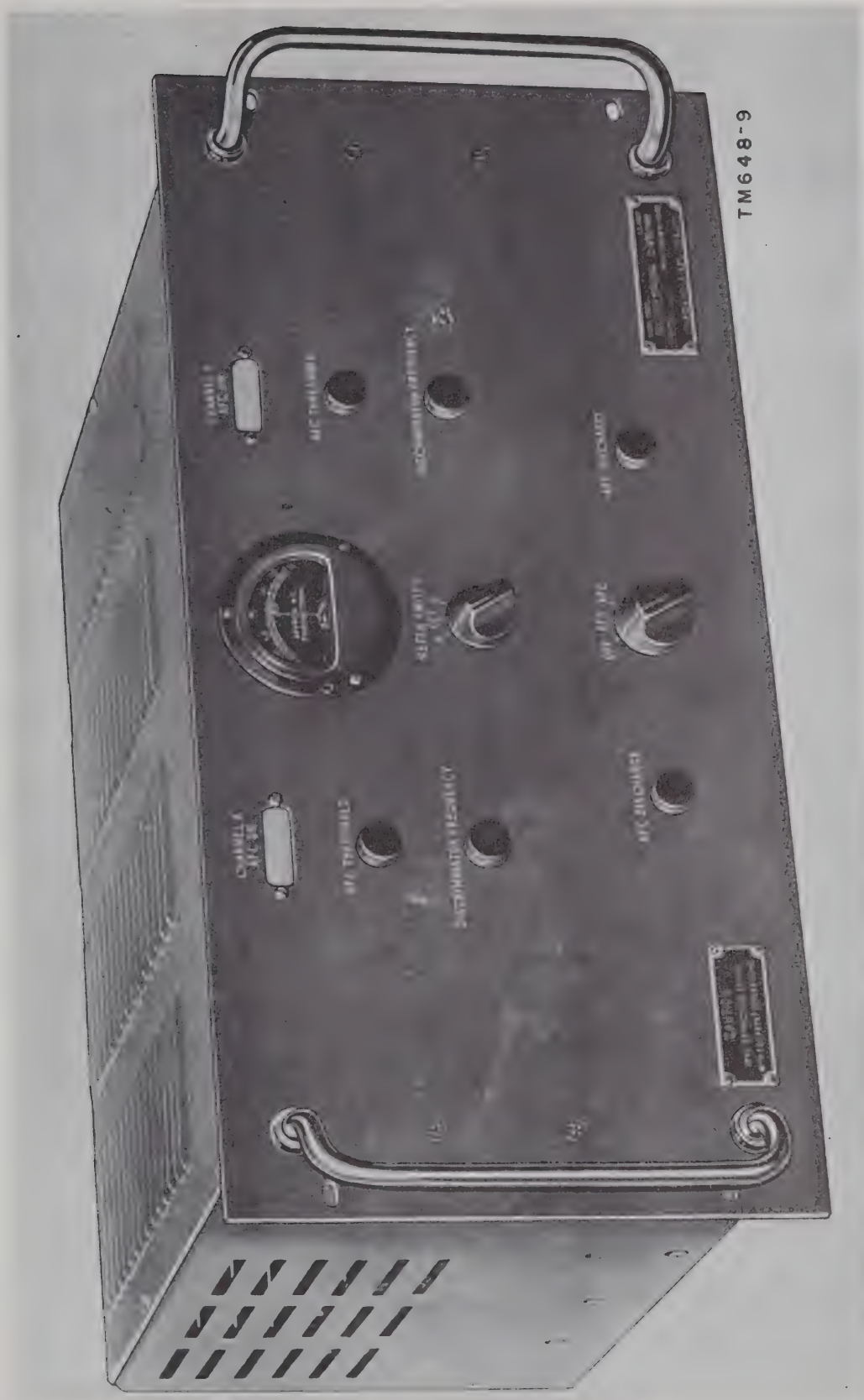


Figure 6. Receiver Control C-975/URR, front view.



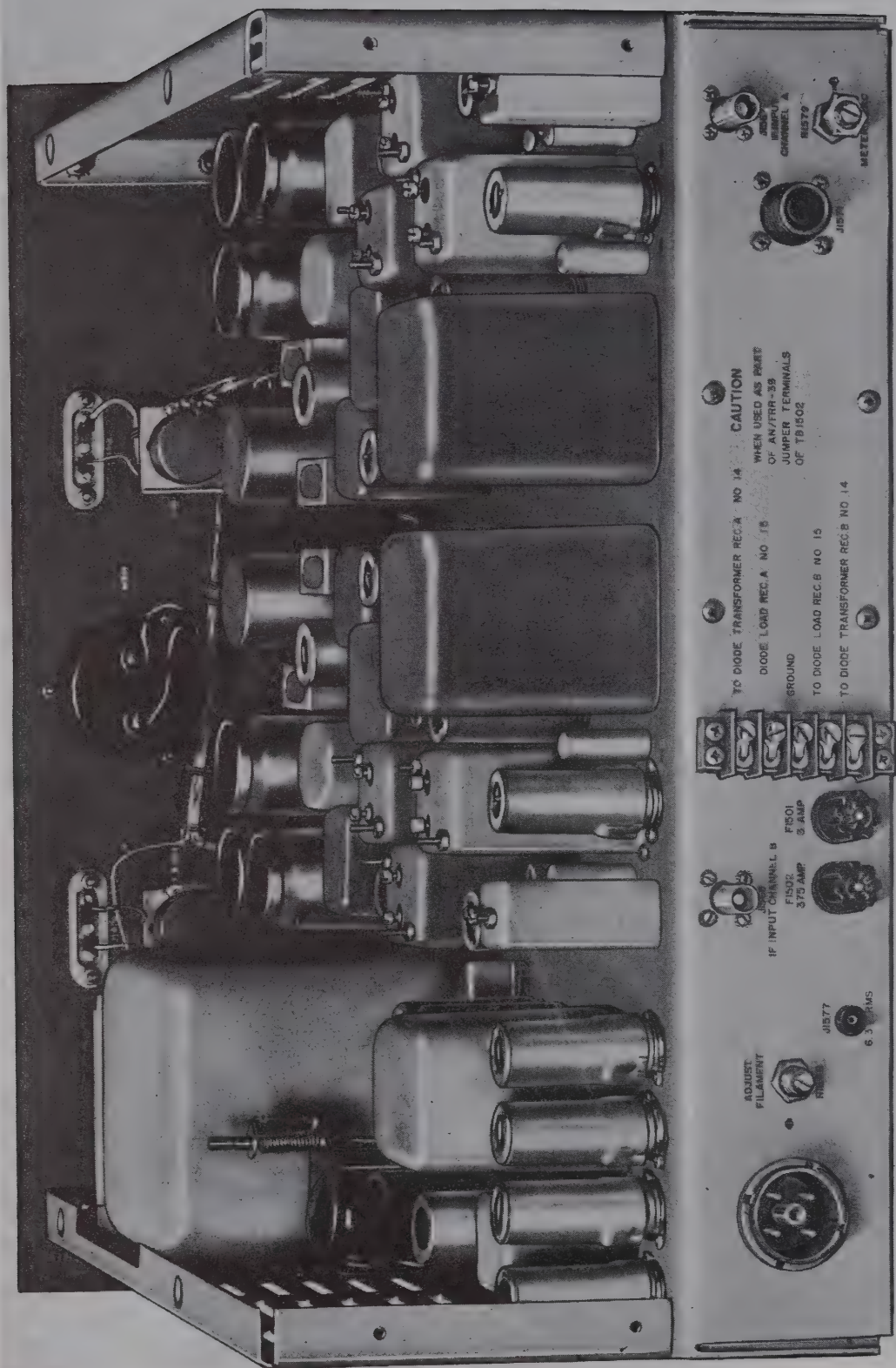


Figure 7. Receiver Control C-975/URR, rear view.

moval and replacement of the unit. A bottom dust cover is held in place by Phillips-head screws; a top dust cover is secured by a combination of Phillips-head screws and Dzus fasteners.

b. For each channel (CHANNEL A or CHANNEL B) a number of controls are mounted on the front panel. These include a CHANNEL A (or B) AFC ON indicator lamp, an AFC THRESHOLD control, a DISCRIMINATOR FREQUENCY control, and an AFC DISCHARGE control. Also mounted on the front panel is METER SWITCH A-OFF-B, which places a meter in one of the afc channels to indicate the approximate correction (in kc) provided by the selected channel. The OFF-BFO-AFC function control switch is also located on the front panel.

c. Located on the rear of the chassis are: IF INPUT CHANNEL A receptacle J1567, IF INPUT CHANNEL B receptacle J1568, operating fuses F1501 3 AMP and F1502 .375 AMP, ADJUST FILAMENT control R1646, power input receptacle J1570, test jack J1577 (6.3 V RMS) for the regulated filament voltage, METER ZERO adjustment, a receptacle J1571 for the control cable that supplies ground circuit to the relay power supply, and a terminal board to provide connection points to the detector diode load circuits of the companion receivers.

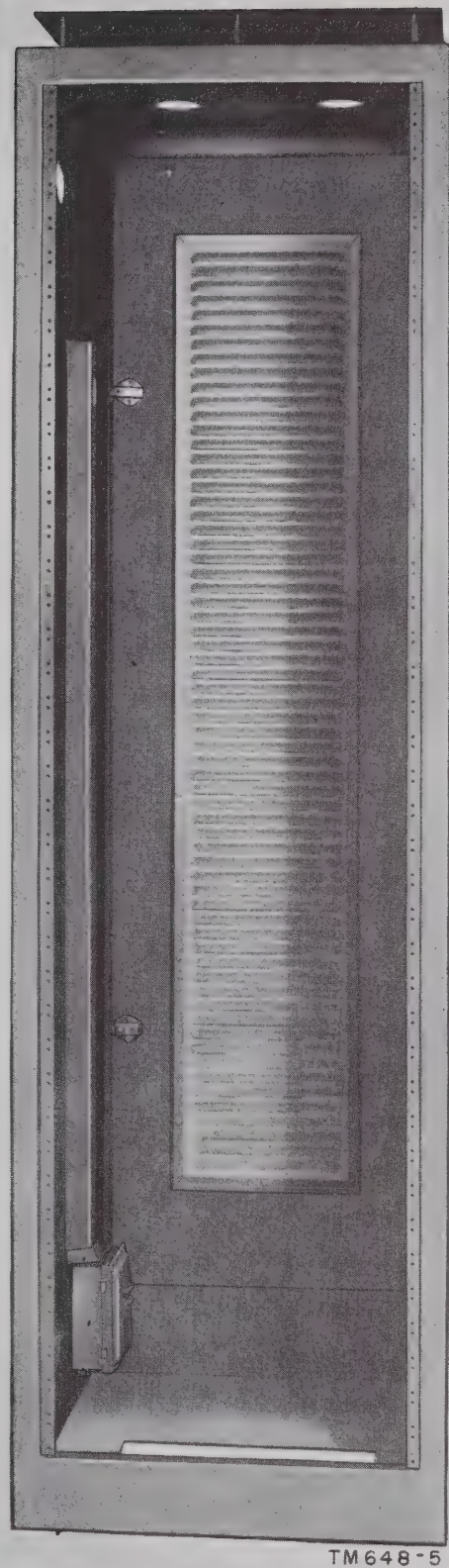
d. A B+180 V test jack J1569 is located on the top of the chassis.

## 11. Description of Electrical Equipment

### Cabinet CY-1119/U

(figs. 8 and 9)

Electrical Equipment Cabinet CY-1119/U provides a single housing and support for the components of a system such as Radio Receiving Set AN/FRR-39. Mounting screws for the radio receiving set units are secured in tapped holes in vertical rack channels on either side of the front opening of the cabinet. A door at the rear of the cabinet permits access to the rear of all components, for changing tubes, maintenance, and adjustments. An ac power distribution channel, on one side of the cabinet (fig. 9), provides eight receptacles for ac power connections. At the bottom of the distribution channel is the main ac input box, containing line fuses and an on-off switch. On the opposite side of the cabinet is a common ground bus, containing tapped holes for securing grounding straps from the various units of the radio receiving set. The top of the cabinet is



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Figure 8. Electrical Equipment Cabinet CY-1119/U, front view.



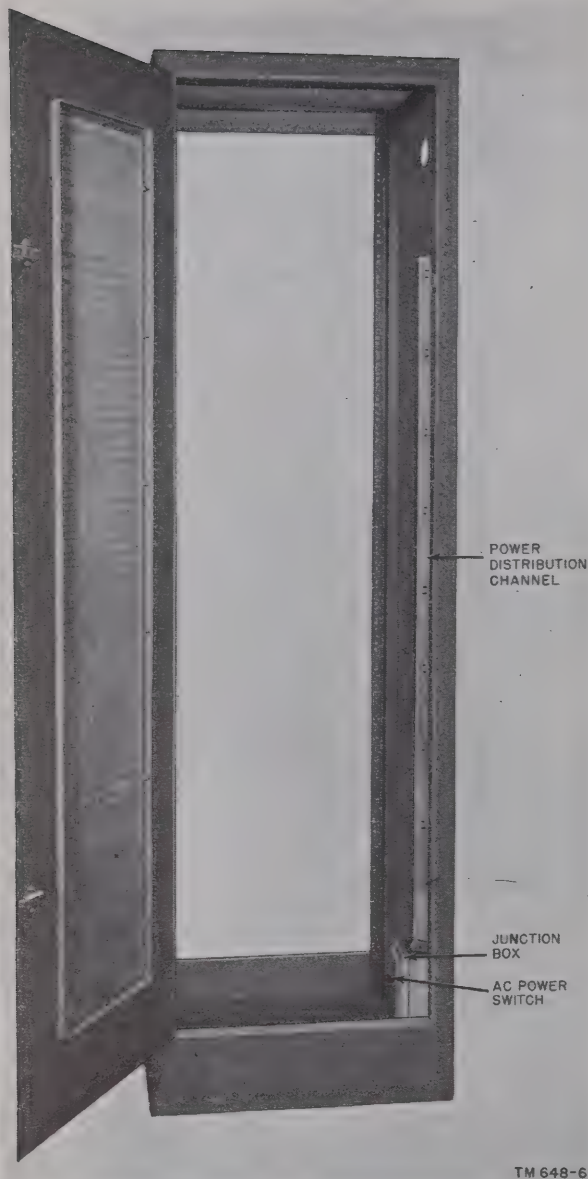


Figure 9. Electrical Equipment Cabinet CY-1119/U, rear view.

partially screened for ventilation, and a dust cover over the screening prevents dust from settling in the equipment. The bottom of the cabinet contains a slot through which the input and output connections are brought to the equipment.

## 12. Cable Assemblies

(fig. 10)

*a. Radio Receiver R-390/URR.* The ac power cable (Power Cable Assembly CX-1358/U) supplied with each radio receiver consists of an 8-foot

two-conductor cable, terminated in a screw-locking plug at one end and a standard parallel-prong ac plug at the other end. The screw-locking plug has a center lead screw for securing the cable plug to POWER connector J104 of the receiver.

*b. Receiver Control C-975/URR.* The following five cables are supplied as part of the receiver control:

- (1) Power Cable Assembly CX-1358/U is the same as that supplied with Radio Receiver R-390/URR.
- (2) Two Cords CG-409C/U are supplied, one for each receiver. Each cable assembly provides connections from the if. output of each receiver to each afc channel in the receiver control. Each cable consists of a length of Radio Frequency Cable RG-58C/U, a 50-ohm coaxial cable, terminated at each end with a Radio Frequency Plug UG-88/U.
- (3) Two Electrical Special Purpose Cable Assemblies CX-2753/U are supplied, one for each receiver control afc channel. Each cable assembly connects the output of each afc channel to the detector circuit of the associated receiver. Each consists of a 53-inch, two-conductor, rubber-covered cable with spade lugs at both ends. The conductors are shielded with a tinned copper braid, which is also fitted with spade lugs at each end. This connection provides additional bonding and a common electrical ground reference voltage for the units.

*c. Installation Kit.* Three cables are supplied as part of the installation kit that is shipped with Radio Receiving Set AN/FRR-39.

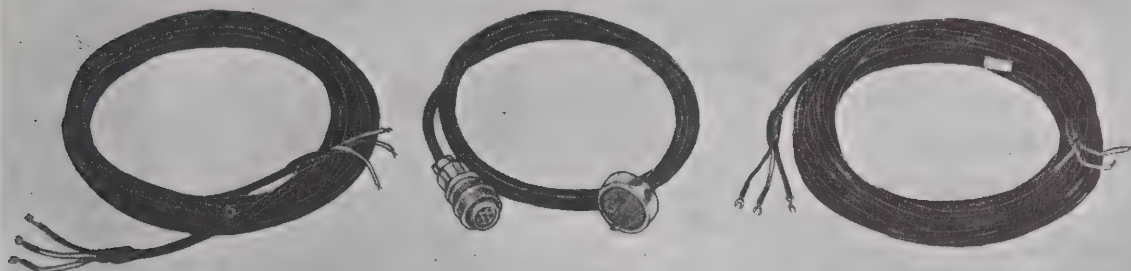
- (1) *Electrical Power Cable Assembly CX-2806/U.* The ac power cable consists of 63½-inch, two-conductor cable, terminated at one end in a standard parallel-prong plug and at the other end in an AN plug type AN3106A-16S-1S-Z. This cable connects ac power to the junction box mounted in the cabinet and thus supplies power to Radioteletype Terminal Equipment AN/FGC-1( ).
- (2) *Electrical Special Purpose Cable Assembly CX-2752/U.* Two Electrical Special Purpose Cable Assemblies CX-2752/U are supplied, one for each receiver. Each cable assembly provides connection from

# INSTALLATION KIT FOR RADIO RECEIVING SET AN/FRR-39

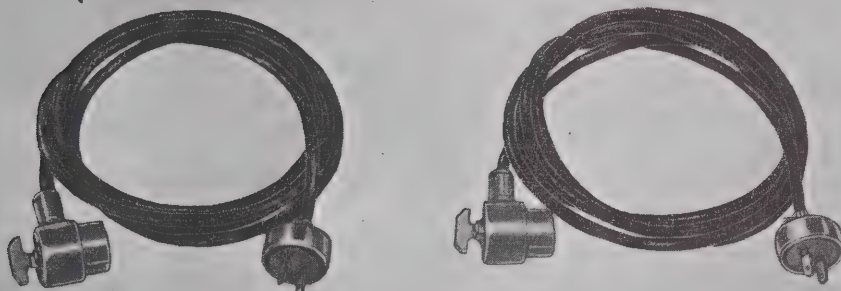
ELECTRICAL SPECIAL PURPOSE  
CABLE ASSEMBLY CX-2752/U

ELECTRICAL POWER CABLE  
ASSEMBLY CX-2806/U

ELECTRICAL SPECIAL PURPOSE  
CABLE ASSEMBLY CX-2752/U

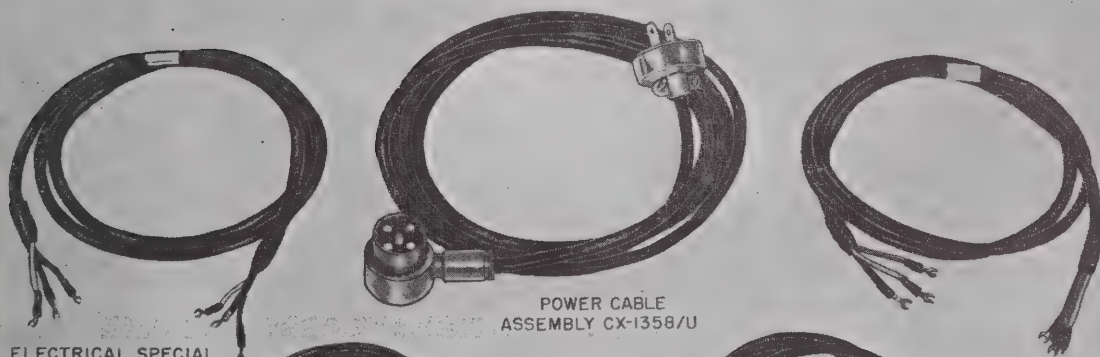


## RADIO RECEIVER R-390/URR



POWER CABLE ASSEMBLIES CX-1358/U

## RECEIVER CONTROL C-975/URR



ELECTRICAL SPECIAL  
PURPOSE CABLE  
ASSEMBLY CX-2753/U

POWER CABLE  
ASSEMBLY CX-1358/U

ELECTRICAL SPECIAL  
PURPOSE CABLE  
ASSEMBLY CX-2753/U



CORDS CG-409 C/U

TM648-11

Figure 10. Cable assemblies.

the audio output of each receiver to each channel input circuit in the radioteletype terminal equipment and consists of approximately 15 feet of two-conductor, shielded, rubber-covered cable with spade lugs on the receiver end and tinned leads at the radioteletype end. The tinned copper-braid shield is also fitted with a spade lug at the receiver end.

### 13. Running Spares

A group of running spares is supplied with each component of Radio Receiving Set AN/FRR-39. The following is a list of running spares:

*a. Radio Receiver R-390/URR.*

- 2 tubes, type 3TF7
- 6 tubes, type 6AJ5
- 2 tubes, type 6AK6
- 1 tube, type 6BH6
- 3 tubes, type 6BJ6
- 2 tubes, type 6C4
- 1 tube, type 12AT7
- 3 tubes, type 12AU7
- 1 tube, type 26Z5W
- 1 tube, type 5651
- 4 tubes, type 5749/6BA6W
- 1 tube, type 6082
- 4 dial lamps, type GE 327
- 6 fuses,  $\frac{3}{8}$ -ampere, 125-volt, slow blow, MS type FO2DROOB

- 6 fuses, 3-ampere, 125-volt, slow blow, MS type FO2DROOB

*b. Receiver Control C-975/URR.*

- 1 tube, type 2D21W
- 1 tube, type 3A4
- 2 tubes, type 6C4
- 1 tube, type 6J4
- 1 tube, type 12AX7
- 2 tubes, type 12AU7
- 1 tube, type 26Z5W
- 1 tube, type 6082
- 2 tubes, type 6BJ6
- 1 tube, type 5651
- 4 tubes, type 6BH6
- 2 tubes, type 5654/6AK5W
- 1 lamp, neon, Littelfuse #9
- 5 fuses,  $\frac{3}{8}$ -ampere, type 3AG
- 5 fuses, 3-ampere, type 3AG

*c. Installation Kit for Radio Receiving Set AN/FRR-39.*

- 2 fuses, 10-ampere, 125-volt, screw base

### 14. Additional Equipment Required

The materials and equipment not supplied as part of Radio Receiving Set AN/FRR-39, but required for its installation and operation, are a complete diversity antenna system, a source of ac power, radioteletype equipment such as Radioteletype Terminal Equipment AN/FGC-1( ), teletypewriter printer equipment, and a headset such as Navy type CW-49507.



## CHAPTER 2

### INSTALLATION

---

#### 15. Siting

(fig. 11)

*a. External Requirements.* The best location for Radio Receiving Set AN/FRR-39 depends on the various local conditions. The type of housing available, the terrain, the need for easy access to messengers, etc., may influence the requirements. Best communication results when the radio receiving set is operated in a high open location with no hills or large structures between points of communication. Avoid operation near steel structures, dense woods, or other obstructions. Flat ground is desirable. Transmission over water is normally better than over land. Avoid locations where drainage conditions may lead to flooding of the shelter. Figure 11 illustrates good and bad siting conditions. A spacing of 600 feet between the antennas is considered optimum. If the terrain does not permit this spacing, diversity action can still be achieved by smaller or larger separations, with a possible reduction in results.

*b. Internal Requirements.* The equipment shelter must meet the following requirements:

- (1) The floor must be capable of withstanding the weight (par. 7) of the equipment in a level position.
- (2) The ceiling must be high enough (par. 7) for vertical installation of the equipment.
- (3) Sufficient space must be allowed behind the cabinet to open the door and sufficient space must be provided on one side so that it is possible to walk to the rear of the cabinet.
- (4) Provisions must be made either to place the auxiliary printing equipment that is used with the radio receiving set close to the equipment or to provide facilities for interconnecting cables.
- (5) Sufficient space must be available for repair work.

- (6) Adequate lighting for day and night operation must be provided. Position the cabinet so that the panel designations may be read easily by the operating personnel. Artificial lighting should be accomplished with light bulbs placed so that the light falls directly on the panel. A portable drop lamp and extension cord are convenient for operating and maintenance personnel.
- (7) Adequate ventilation must be provided. If necessary, remove dust covers of each unit and the blank panels from the front of the equipment rack.

#### 16. Uncrating, Unpacking, and Checking New Equipment

*Note.* For used or reconditioned equipment, refer to paragraph 19.

*a. General.* The electrical equipment cabinet may be shipped in oversea or domestic packing cases. In both types of packing, the cabinet is shipped in a wooden crate. The component units of the radio receiving set are packed identically for both export and domestic shipment. When the equipment is received, select a location where the equipment may be unpacked without exposure to the elements and which is close to the permanent or semipermanent installation of the equipment. Instructions for packing the electrical equipment cabinet are given in *b* below. Instructions for unpacking the component units are given in *c* below.

*b. Step-by-Step Instructions for Unpacking Electrical Equipment Cabinet CY-1119/U* (fig. 12).

- (1) Place the crate containing the cabinet as near the operating position as possible.
- (2) Cut and fold back the metal straps.
- (3) Remove the nails with a nail puller. Remove the top and two sides from the

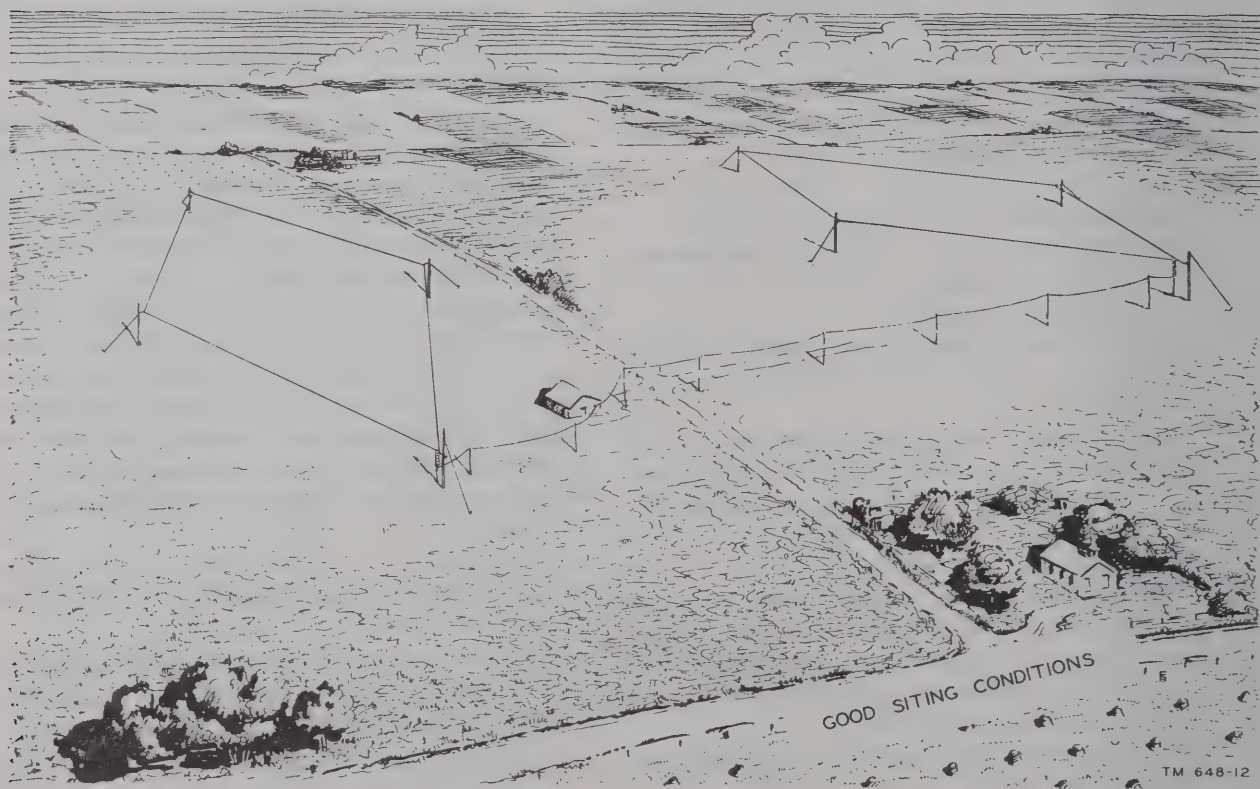


Figure 11. Siting.



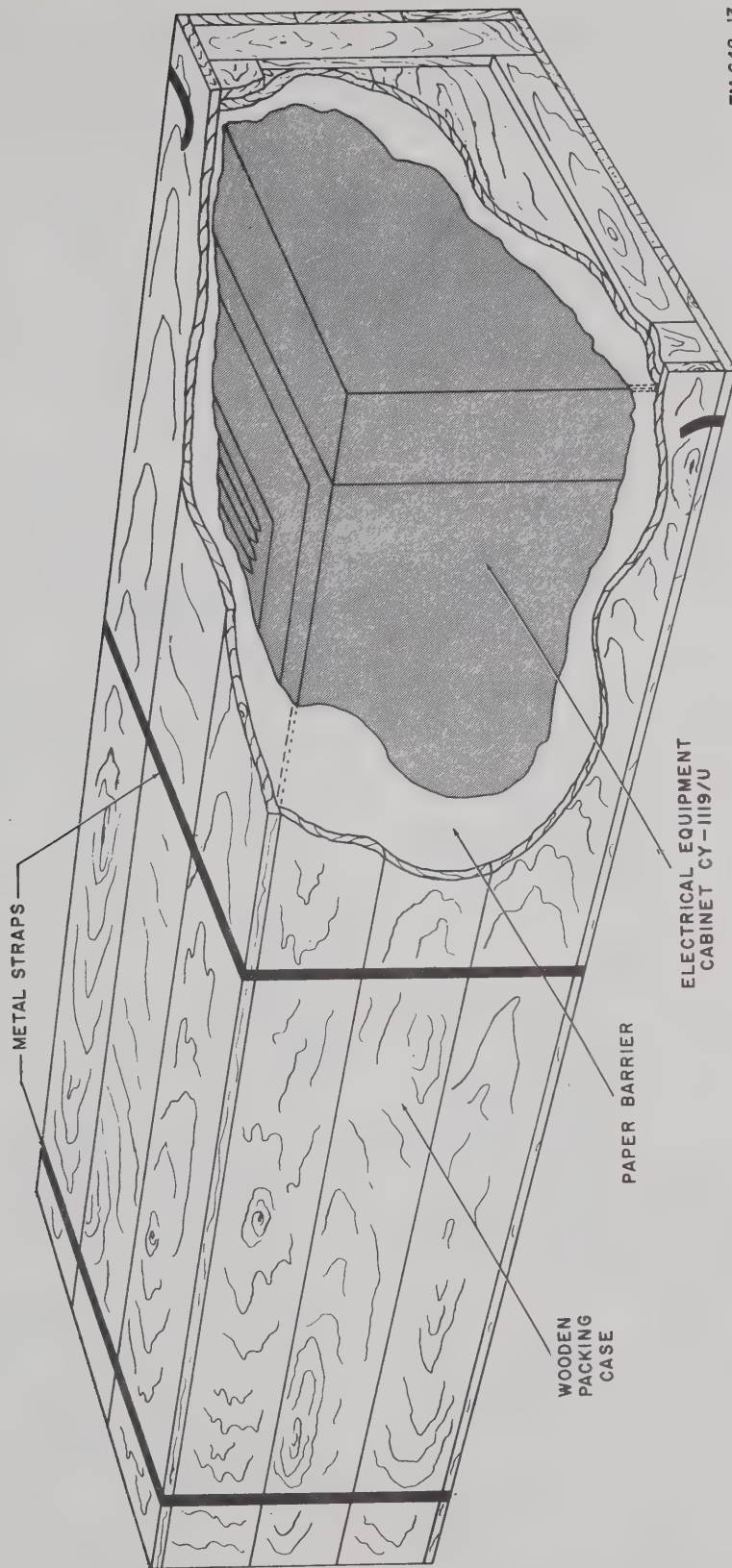


Figure 12. Electrical Equipment Cabinet CY-1119/U, typical packing and packaging diagram.



crate. Do not attempt to pry off the sides and top; this may damage the equipment.

- (4) Lift the cabinet out of the crate and position the cabinet as specified in paragraph 15b.
- (5) Remove the paper barrier.
- (6) Inspect the cabinet for possible damage incurred during shipment.
- (7) Check the contents of the packing case against the master packing slip.

*c. Step-by-Step Instructions for Uncrating and Unpacking Component Units of Radio Receiving Set AN/FRR-39 (fig. 13).*

- (1) Place the packing cases containing the component units as near the operating location as possible.
- (2) Cut and fold back the metal straps.
- (3) Remove the nails with a nail puller. Remove the top and one side of the wooden shipping crate. Do not attempt to pry off the side and top; this may damage the equipment.
- (4) Remove the excelsior covering the paper-wrapped, sealed carton inside the crate and take out the carton.
- (5) Remove the technical manuals, running spares, and accessories, then open the corrugated fiberboard carton, and withdraw the inner carton inclosed in the moisture-vaporproof barrier.
- (6) Slit the seams of the moisture-vaporproof barrier and remove the inner corrugated fiberboard carton.
- (7) Open the inner carton and remove the wooden spacers.
- (8) Remove the bags of silica gel and the package containing cables from the space at the rear of the unit.
- (9) Withdraw the paper-wrapped unit from the inner carton, place it on a workbench or near its final location, and remove the paper wrapping.

*Note.* Save the original packing cases and containers from both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

*d. Checking.*

- (1) Check the contents of each crate against the master packing slip.
- (2) Check the front panel of each unit for damage to the controls or meters.

- (3) Operate the control knobs; check for ease of operation. Rough operation or binding indicates a damaged control.
- (4) Remove the top and bottom dust covers of each unit and inspect for loose tube shields or broken tubes.
- (5) Remove the fuses from the rear panel. Check to see that they are of the proper rating. See that the fuses are properly seated after replacing them.

*Note.* To avoid damage to a unit, do not use a fuse rated above the specified value.

- (6) Inspect for broken or bent connectors on the rear panel.
- (7) Check the contents of the box containing the running spares for missing or damaged parts.

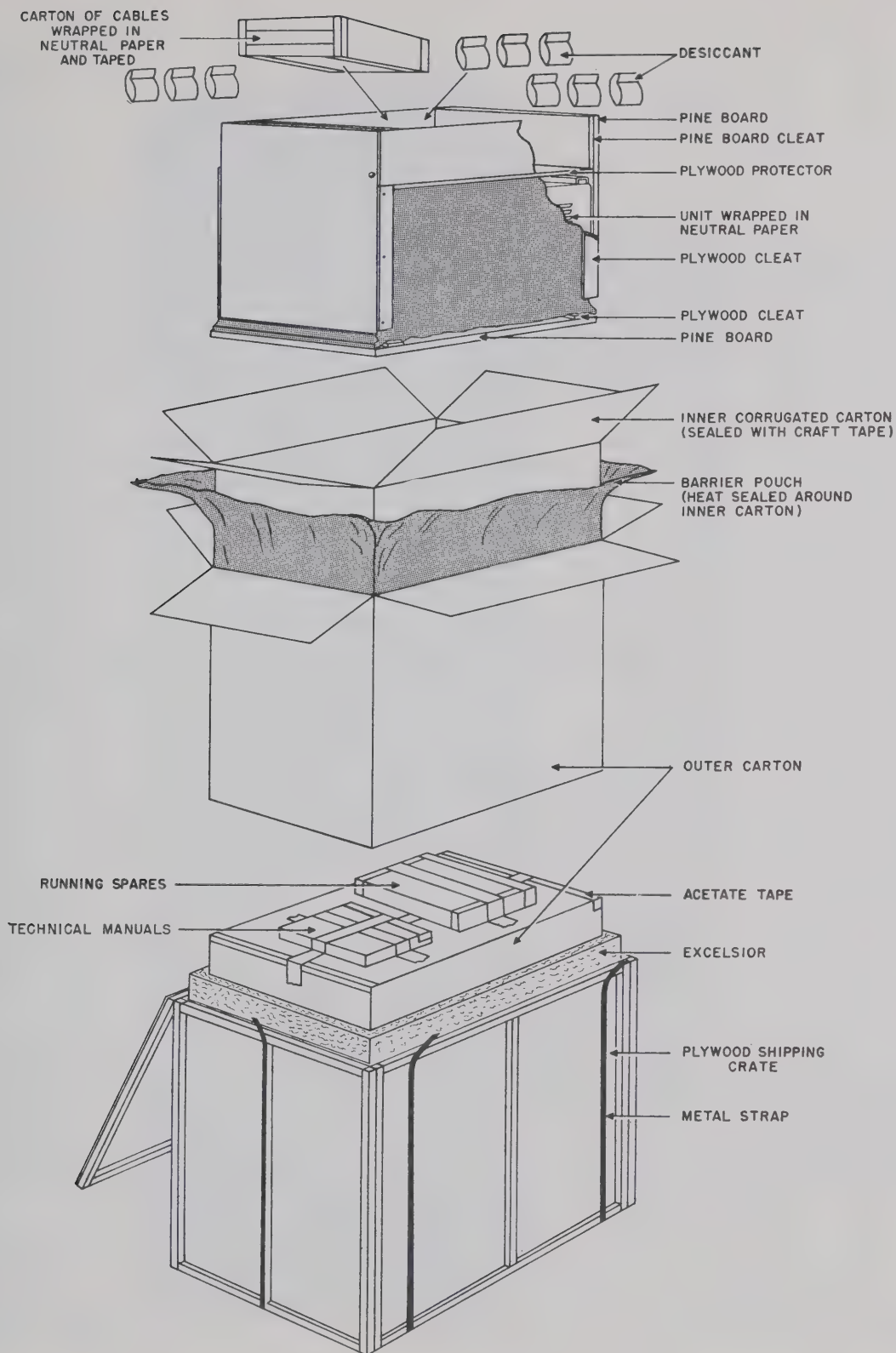
## **17. Installation of Components in Radio Receiving Set AN/FRR-39**

When all components have been uncrated and all material used in packing has been removed, set Electrical Equipment Cabinet CY-1119/U on a level section of floor area that will permit the rear of the equipment to be easily reached. Follow the instructions contained in the *a* through *f* below in assembling the equipment.

*a. Installation Kit.* Remove all the parts of the installation kit and check to see that all parts have been shipped. An itemized list of parts is shown in figures 14 and 15. In the following discussion and in paragraph 18, the lettered references are to call-outs in these two figures. Assemble the equipment in the following sequence.

- (1) Use items K, L, M, N, and O (fig. 15) to mount the six shelf angles (fig. 16). Note the position of the two different washers; the flat washer (M, fig. 15) is located immediately beneath the head of the cap screw (L), while the lockwasher (N) is placed against the cabinet just beneath the nut (O).
- (2) Mount the junction box assembly (Y) on the junction box bracket (X): use 10 each of screw R and lockwasher S. Then mount this assembly on pressed rack bracket P using the remaining two screws, washers, and nuts called out as items L, M, N, and O.

*Note.* To position the receivers and receiver control properly, the brackets may have to be readjusted.

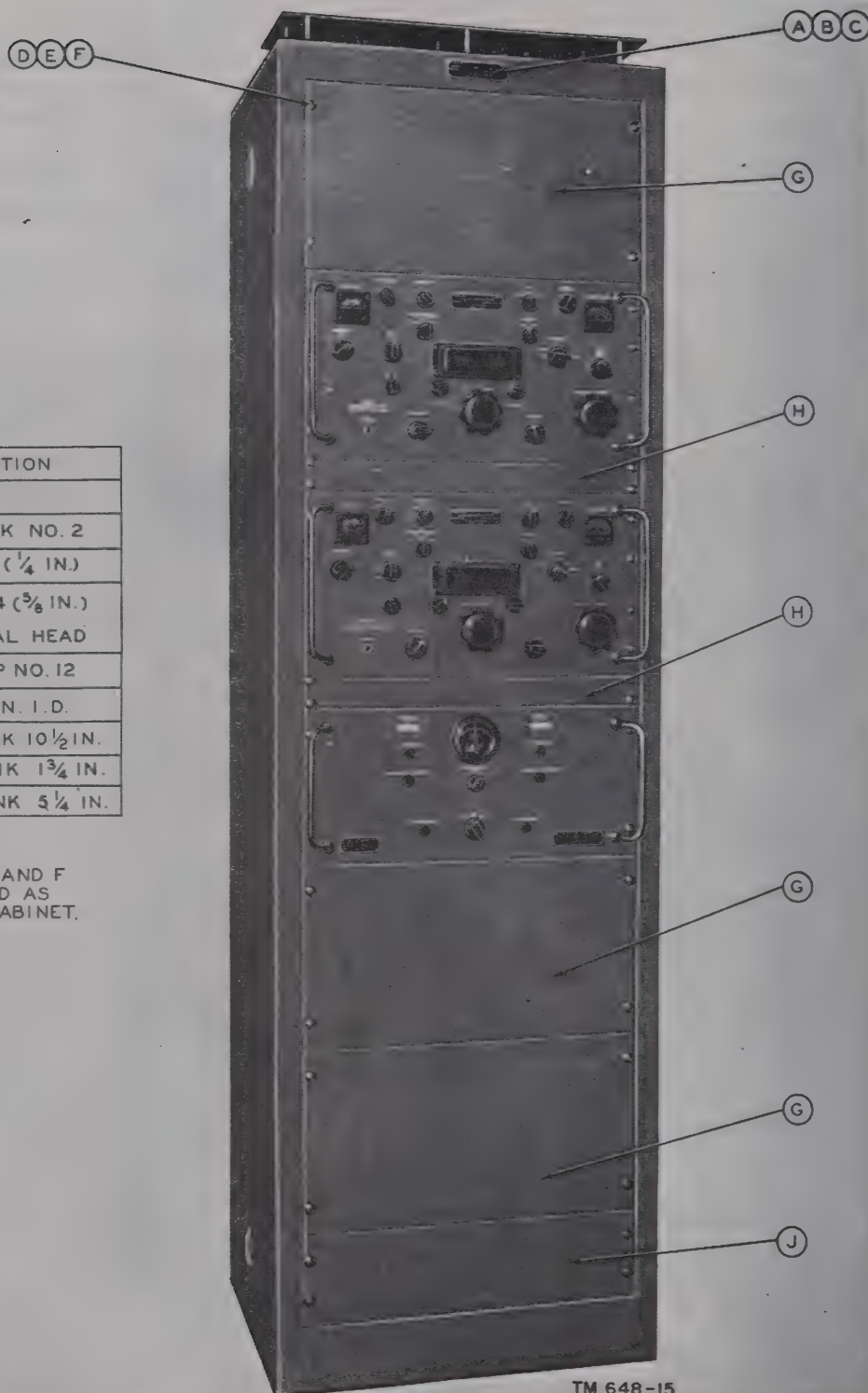


TM 648-14

Figure 13. Radio Receiving Set AN/FRR-39, typical component packing and packaging diagram.

ITEM	QTY.	DESCRIPTION
A	1	NAMEPLATE
B	4	WASHER : LOCK NO. 2
C	4	SCREW : 2-56 ( $\frac{1}{4}$ IN.)
D	44	SCREW : 12-24 ( $\frac{5}{8}$ IN.) PHILLIPS OVAL HEAD
E	44	WASHER : CUP NO. 12
F	44	WASHER : $\frac{5}{16}$ IN. I.D.
G	3	PANEL : BLANK 10 $\frac{1}{2}$ IN.
H	2	PANEL : BLANK 1 $\frac{3}{4}$ IN.
J	1	PANEL : BLANK 5 $\frac{1}{4}$ IN.

NOTE: ITEMS D, E AND F  
ARE SHIPPED AS  
PART OF CABINET.



TM 648-15

Figure 14. Installation diagram, front view.



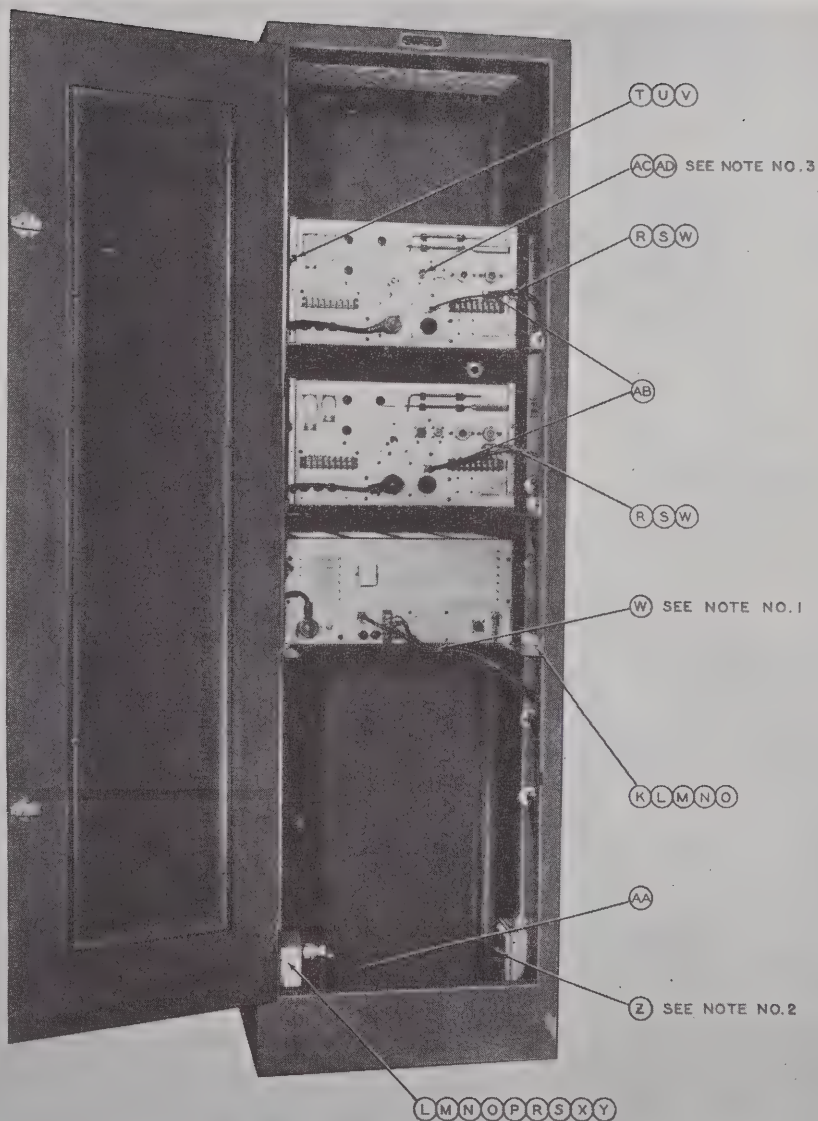
ITEM	QTY	DESCRIPTION
K	6	ANGLE : SHELF
L	14	SCREW : CAP 1/4 - 20 (3/4 IN.)
M	14	WASHER : FLAT - 1/4 IN.
N	14	WASHER : LOCK - 1/4 IN.
O	14	NUT : SQUARE 1/4 - 20
P	1	BRACKET : PRESSED RACK
R	12	SCREW : 6-32 (3/8 IN.)
S	12	WASHER : SPLIT LOCK NO.6
T	3	STRAP : GROUND
U	3	SCREW : 10-32 (3/8 IN.)
V	3	WASHER : SPLIT LOCK NO.10
W	3	CLAMP : CABLE - 1/2 IN I.D.
X	1	BRACKET : JUNCTION BOX
Y	1	BOX ASSEMBLY : JUNCTION
Z	4	FUSE : 10 AMPERE
AA	1	CABLE : POWER
AB	2	CABLE : AUDIO
AC	3	CONNECTOR : UG-573/U
AD	3	CONNECTOR : UG-971/U

NOTE:

1. USE THE SCREW AND WASHER HOLDING THE DUST COVER IN PLACE TO FASTEN THIS CABLE CLAMP.

2. TWO SPARE FUSES ARE INCLUDED.

3. PLUGS AND ADAPTERS ARE PROVIDED FOR ANTENNA INPUT CABLES. A SPARE SET IS INCLUDED.



TM 64B-16

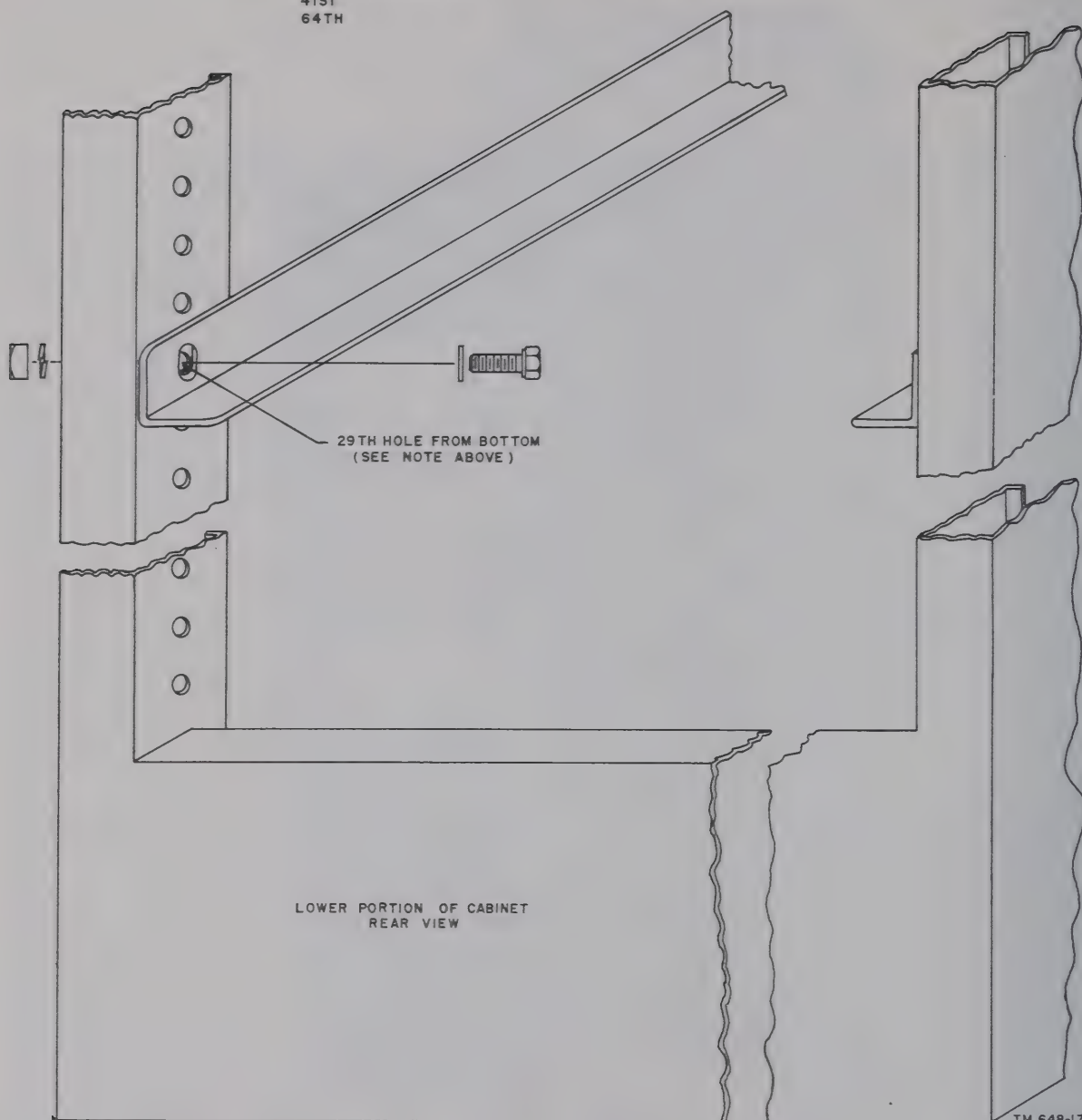
Figure 15. Installation diagram, rear view.

NOTE: ANGLE IRON BRACKETS ARE SPACED AS SHOWN BELOW.  
 START AT LAST HOLE NEAR BOTTOM OF CABINET ON EITHER  
 SIDE AND COUNT UPWARD. FASTEN BRACKETS TO CORRESPONDING HOLES.

29TH FROM BOTTOM

41ST

64TH



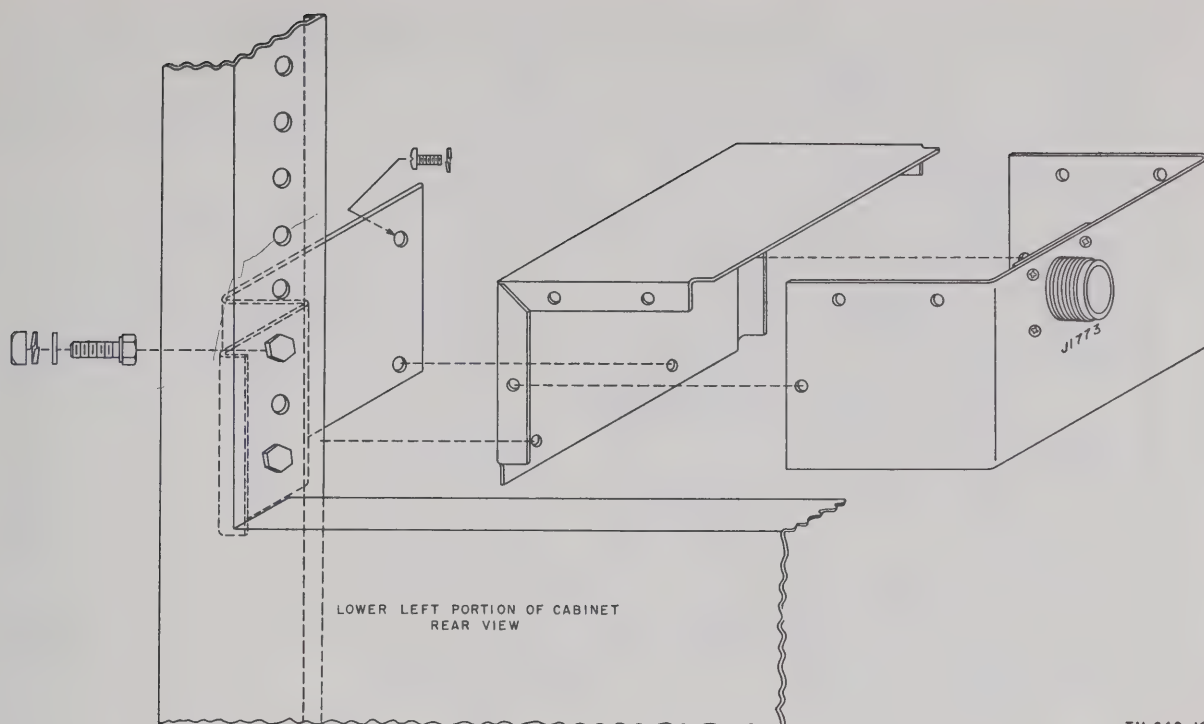
TM 648-17

Figure 16. Shelf angles, mounting diagram.

*b. Radio Receiver R-390/URR.* Before installing the receivers, check all tubes to see that they are firmly seated in their correct sockets (figs. 18 and 19). Install the two receivers on the two top pairs of shelf angles. Use eight screws (D), cup washers (E), and flat washers (F) to mount each receiver to the cabinet. Throughout the remainder of the technical manual, the receiver selected for

installation on the topmost pair of angles will be referred to as receiver B and the lower receiver will be called receiver A.

*c. Receiver Control C-975/URR.* Before installing the receiver control, check all tubes for firm seating in correct sockets before installation (fig. 20). Install the receiver control on the lowest pair of shelf angles. Use four each of items D, E,



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Figure 17. Junction box, mounting diagram.

and F to mount the receiver control to the cabinet.

*d. Blank Panels.* Mount the blank panels, items G, H, and J, in the positions indicated (fig. 14). Use items D, E, and F to mount the panels.

*e. Grounding Straps* (fig. 15). Connect a ground strap (T) from each of the receivers and the receiver control to the ground bus of the cabinet. Mount one end of the ground strap under a screw on the rear of each of the three units and use screw U and lockwasher V to connect the other end to the ground bus.

*f. Nameplate.* Attach the nameplate (A) to the position indicated (fig. 14); use the four screws (C) and lockwashers (B).

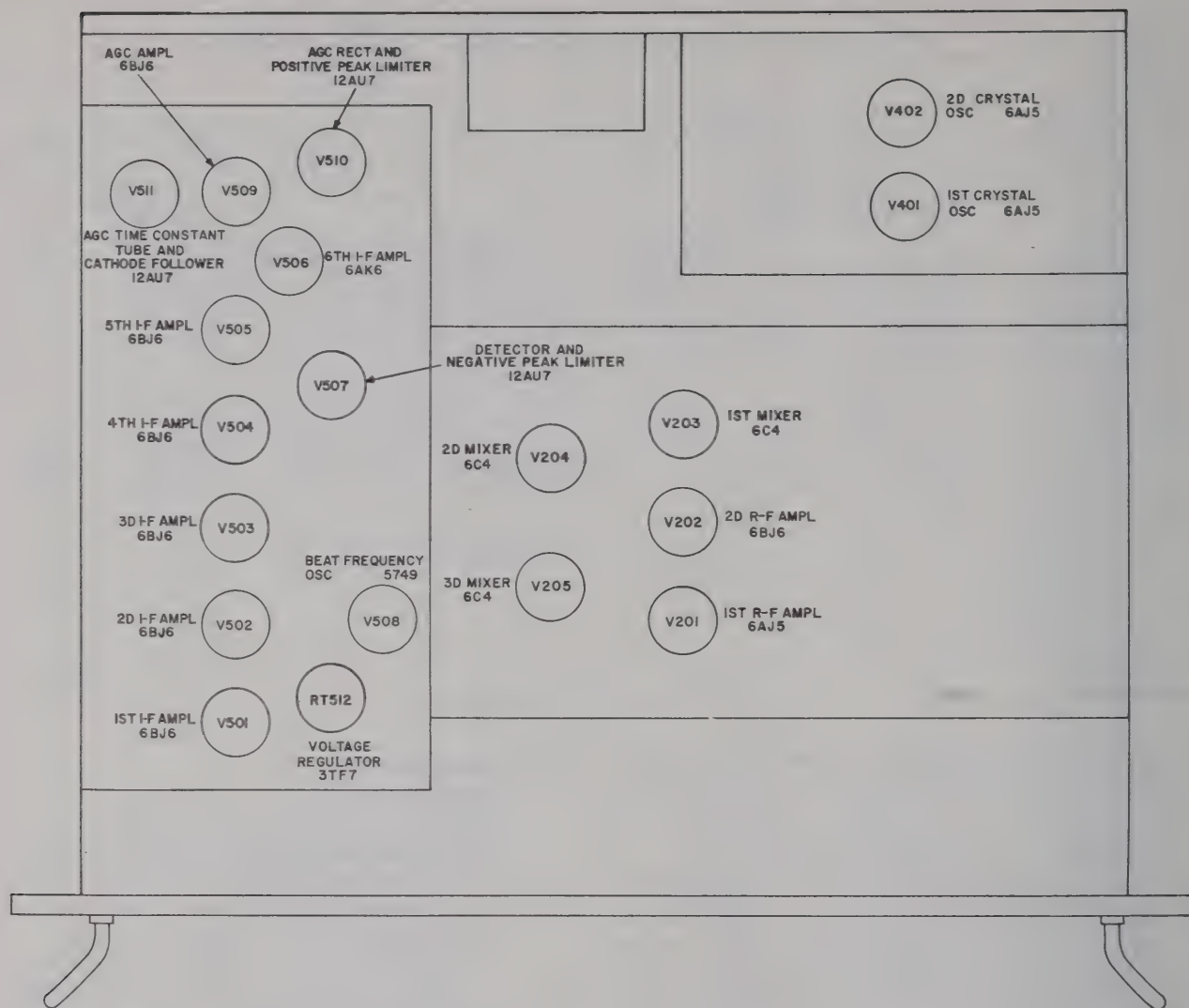
## 18. Connections

### a. Interconnections.

- (1) After installing the units (par. 17), connect the cables to the units as shown in the cording diagram (fig. 21). When connecting the audio and if. cables to the two receivers, use cable clamp W, screw R, and lockwasher S (fig. 15). The cable clamp used with the receiver control (see fig. 15 for placement) is secured with the screw and lockwasher that are also used to hold the bottom dust cover in place. The following chart lists the connections within Radio Receiving Set AN/FRR-39:

Cable assembly	Required No.	From—	To—
Power Cable Assembly CX-1358/U-----	3	Receiver B (J104)-----	Ac power strip.
		Receiver A (J104)-----	Ac power strip.
		Receiver control (J1570)-----	Ac power strip.
Electrical Power Cable Assembly CX-2806/U-----	1	Junction box (J1773)-----	Ac power strip.
Cord CG-409C/U-----	2	Receiver control (J1568)-----	Receiver B (J106).
		Receiver control (J1567)-----	Receiver A (J106).
Electrical Special Purpose Cable Assembly CX-2753/U.	2	Receiver control (TB1501)-----	Receiver B (TB102).
		Receiver control (TB1501)-----	Receiver A (TB102).





TM 648-19

Figure 18. Radio Receiver R-390/URR, tube location, top view.

(2) Electrical Special Purpose Cable Assembly CX-2753/U is connected as follows:

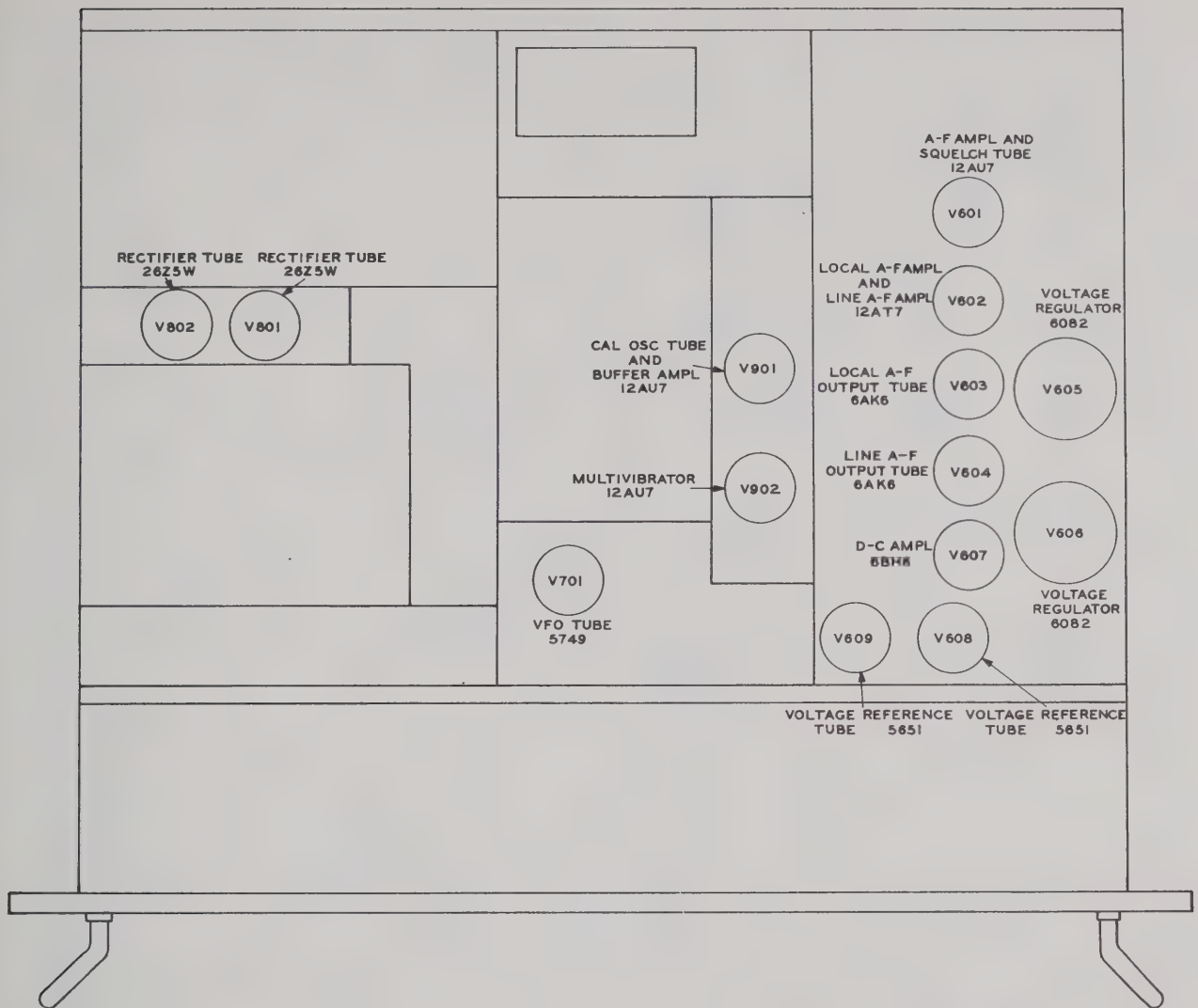
(a) Connect the black lead of one end to TB1501 of the receiver control; use the terminal labeled TO DIODE TRANSFORMER REC. A NO. 14. Connect the white lead to the terminal labeled TO DIODE LOAD REC. A NO. 15 and the shield to GROUND. Connect the other end to TB102 of receiver A, using terminal 14 for the black lead, terminal 15 for the white lead, and terminal 16 for the shield.

(b) Connect the second Electrical Special Purpose Cable Assembly CX-2753/U to the terminals on TB1501 labeled for receiver B and terminal board TB102 of receiver B. Follow the identical color coding used for receiver A.

(3) To tie together the automatic gain control (age) systems of the two receivers, proceed as follows:

(a) Remove the jumper between terminals 3 and 4 of terminal board TB102 on each receiver.

(b) Connect the jumper between terminals 4 and 5 of terminal board TB102 on each receiver.



TM 648-20

Figure 19. Radio Receiver R-390/URR, tube location, bottom view.

- (c) Connect terminal 4 of terminal board TB102, receiver B, to the same terminal of receiver A. (No cable has been provided for this connection.)

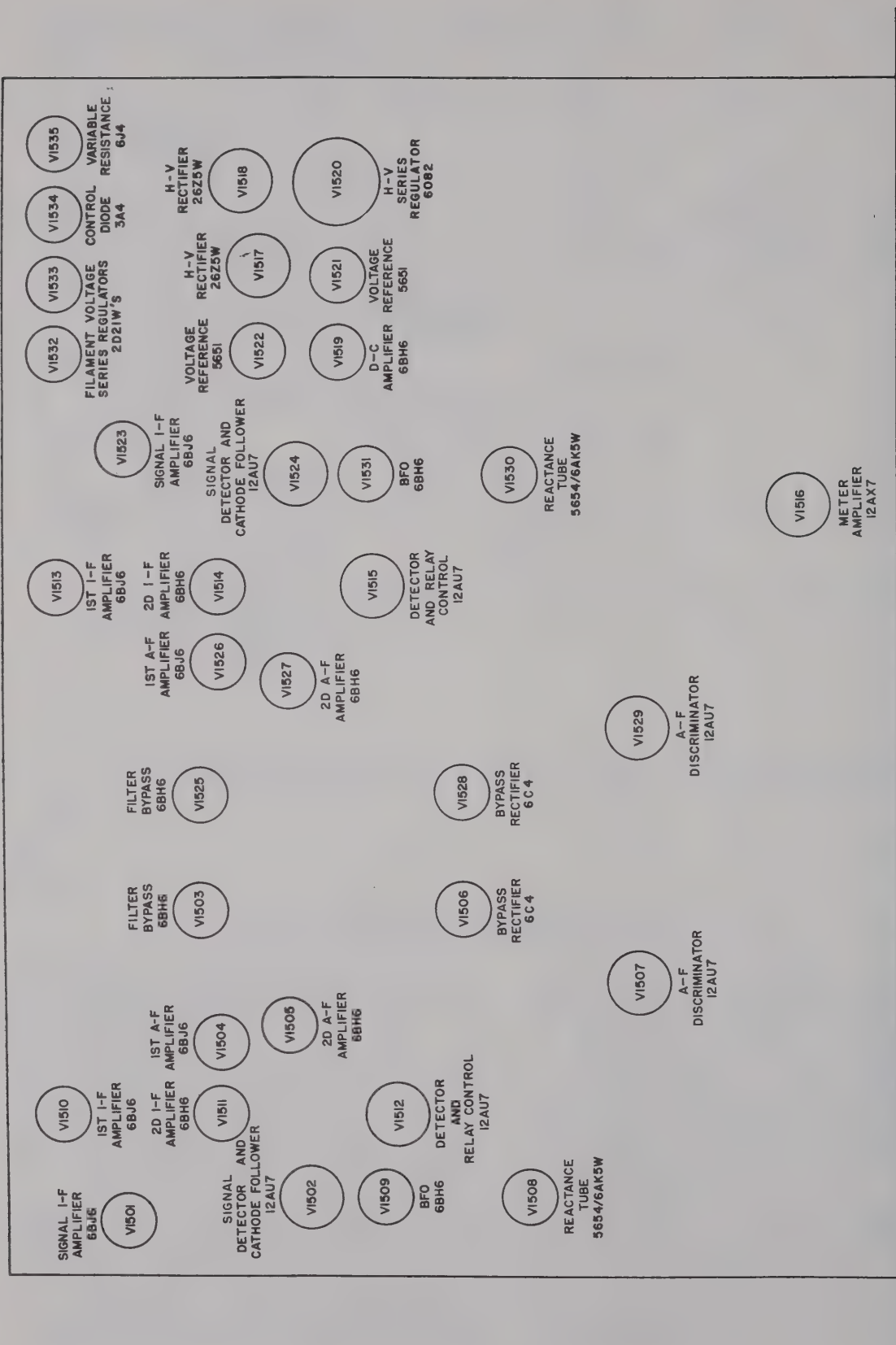
b. *Radioteletype Equipment Connections.* Radio Receiving Set AN/FRR-39 is normally used with Radioteletype Terminal Equipment AN/FGC-1( ). Interconnections are shown in figure 21. Make the following connections:

- (1) Connect the white lead of Electrical Special Purpose Cable Assembly CX-2752/U to terminal 10 of TB102, receiver B; use the end of the cable with spade lugs. Connect the black lead to terminal 13 of

TB102 and ground the shield to terminal 16. Solder the tinned white lead of the other end to terminal 1 of terminal block A, CURRENT LIMITER B, located in the radioteletype terminal equipment. Solder the tinned black lead and the shield to terminal 2 of terminal block A, CURRENT LIMITER B.

- (2) Connect the second Electrical Special Purpose Cable Assembly CX-2752/U to the corresponding terminals of receiver A and CURRENT LIMITER A.

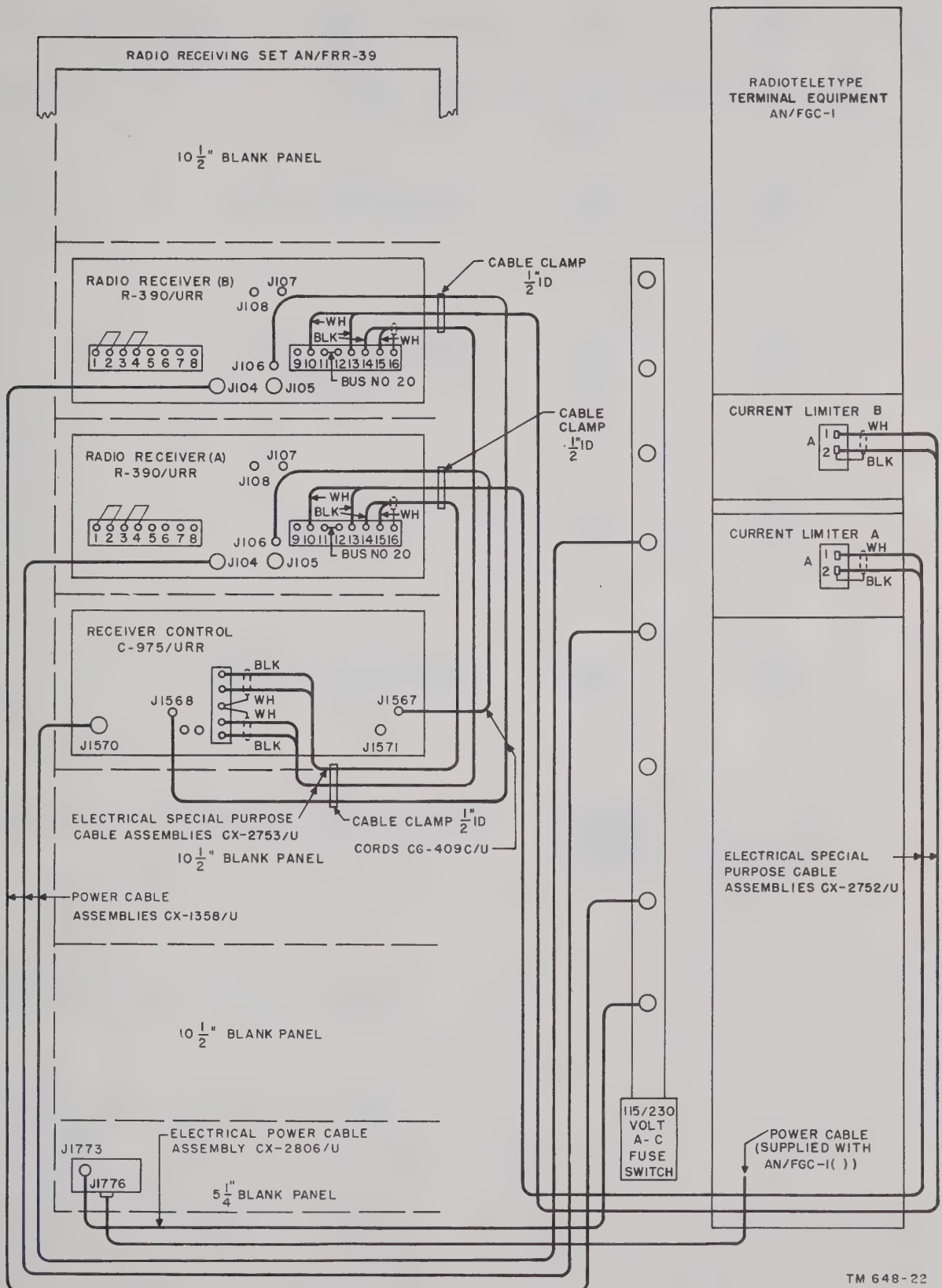
c. *Antenna Connections.* Radio Receiving Set AN/FRR-39 is normally used with doublet or



FRONT  
TOP VIEW OF CHASSIS

Figure 20. Receiver Control C-975/URR, tube location.





TM 648-22

Figure 21. Radio Receiving Set AN/FRR-39, cording diagram.

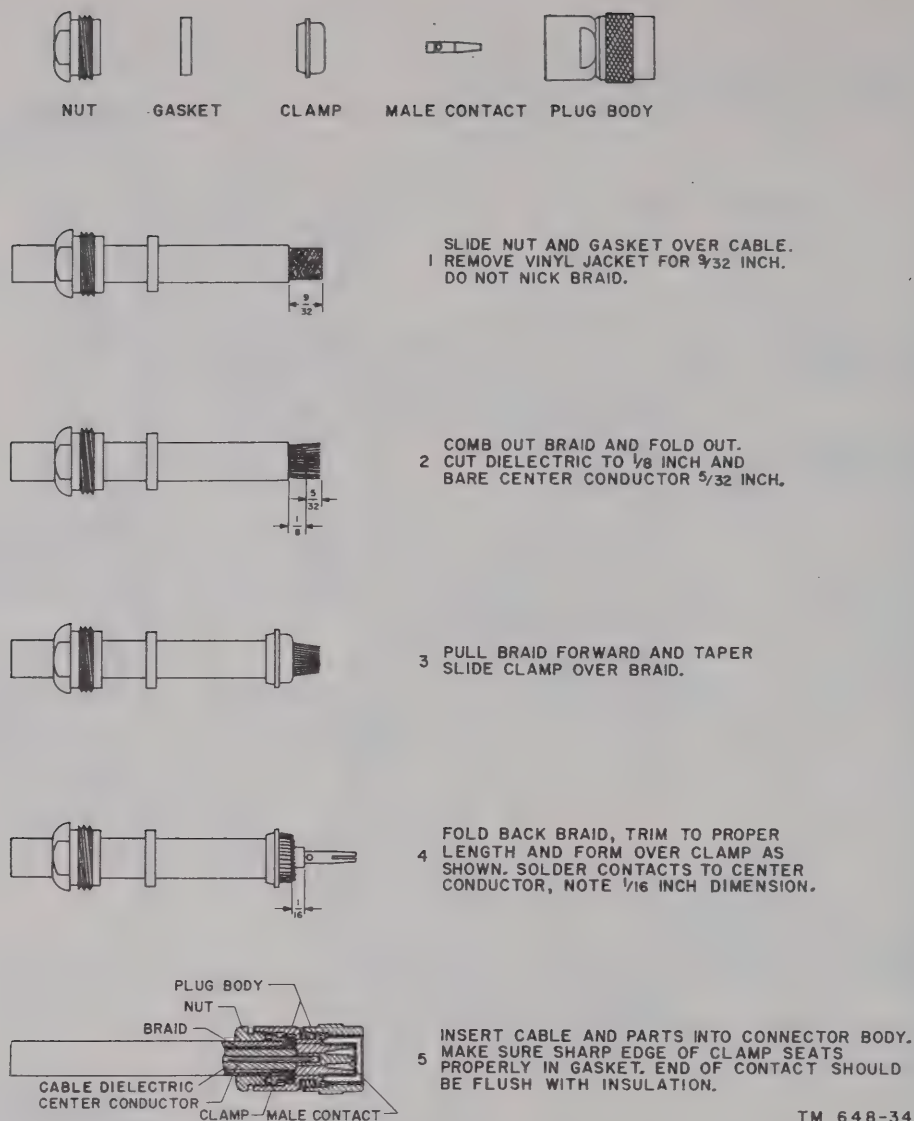


Figure 22. Assembly of Plug Connector UG-573/U to a coaxial cable.

rhombic antennas. For information on antennas suitable for use with this equipment, refer to TM 11-666, Antennas and Radio Propagation. BALANCED ANTENNA 125 OHM connector J108 is normally used in connecting the antennas to the receivers of the radio receiving set. Assemble Plug Connector UG-573/U to the coaxial transmission line (fig. 22). Use Adapter Connector UG-971/U to provide connection between Plug Connector UG-573/U and BALANCED ANTENNA 125 OHM connector J108. Three each plug connectors and adapters are supplied as part of the installation kit. One of each is for each receiver and one for a spare set.

*d. Ac Power Connections.* Input connections from the power source are connected to terminals in the ac switch located near the bottom of the cabinet.

**Caution:** Check to see that 115 or 230 VAC switch S801 on Power Supply PP-621/URR and switch S1503 on Receiver Control C-975/URR are in the proper position for operation of the units from the available power source. To gain access to the switches on the receiver power supplies, remove the bottom dust cover from the bottom of the receivers. To gain access to the switch on the receiver control, remove the top dust cover.

## **19. Service Upon Receipt of Used or Reconditioned Equipment**

*a.* Follow the instructions in paragraph 16 for uncrating, unpacking, and checking the equipment.

*b.* Check the used or reconditioned equipment

for tags or other indications pertaining to changes in the wiring of the equipment. If any changes have been made, note the changes in this manual, preferably on the applicable schematic.

*c.* Perform the installation and connection procedures given in paragraphs 17 and 18.



## CHAPTER 3

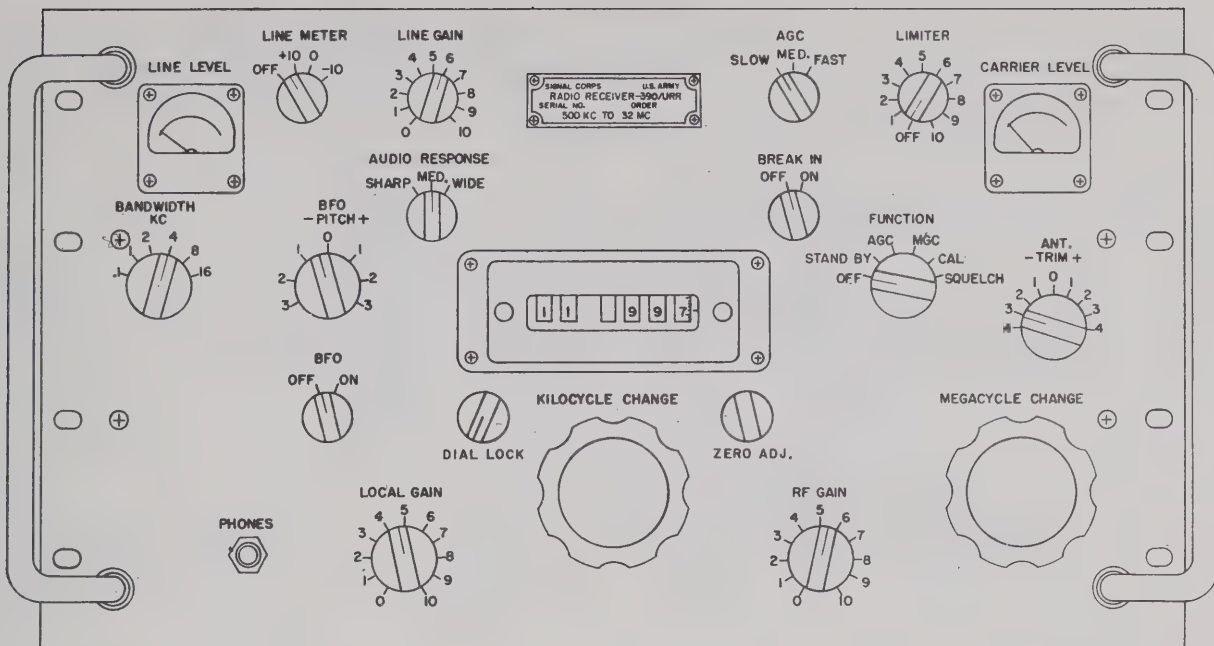
### OPERATION

#### Section I. CONTROLS

*Note.* Haphazard operation or improper setting of the controls can result in failure to receive the message or can cause damage to the radio receiving set. For this reason, it is important to know the function of every control. The actual operation of the equipment is discussed in paragraphs 22 through 28.

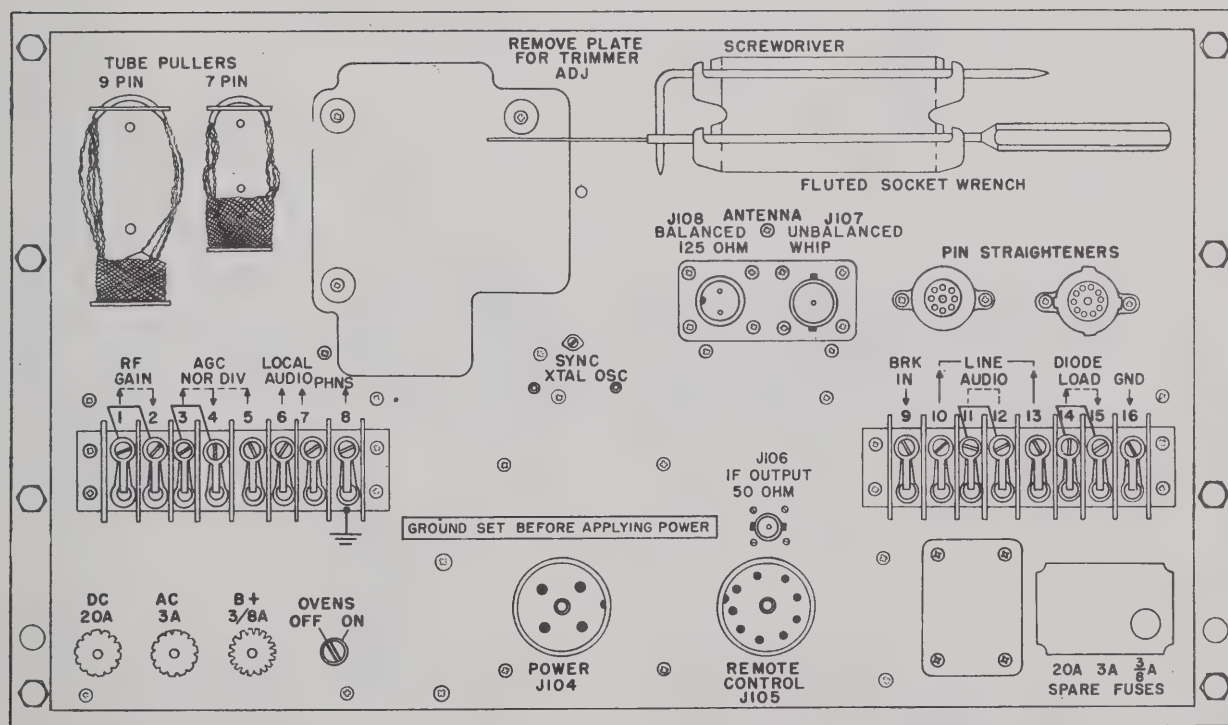
#### 20. Radio Receiver R-390/URR Controls (figs. 23 and 24)

Controls	Function												
LINE LEVEL meter-----	Indicates level of balanced-line output.												
LINE METER off-on and range switch-----	In OFF position, switch disconnects LINE LEVEL meter from balanced-line output. In +10 position, 10 db is added to LINE LEVEL vu reading; in 0 position, LINE LEVEL meter is read directly in vu; in -10 position, 10 db is subtracted from LINE LEVEL vu reading.												
LINE GAIN control-----	Controls level of af signal applied to balanced-line output terminals.												
AGC SLOW-MED.-FAST time constant switch.	Determines rapidity of change in gain of receiver for a certain change of signal strength.												
LIMITER off-on switch and threshold control	In any position other than OFF, adjusts limiting of peak signal impulses to reduce static interference.												
CARRIER LEVEL meter-----	Indicates level of incoming rf signal.												
BANDWIDTH switch-----	Selects width of the pass band in kc for 455-kc if. amplifier stages.												
BFO OFF-ON switch-----	In ON position, places bfo in operation.												
BFO PITCH control-----	Varies frequency of bfo.												
AUDIO RESPONSE switch-----	Varied response of audio amplifier. In SHARP position there is best reception of radio telegraph signals; in MED. position there is best intelligibility of voice signals; in WIDE position, no filter is used.												
BREAK IN OFF-ON switch-----	In ON position, receiver is disabled during transmission to prevent damage to input circuits.												
FUNCTION switch-----	When rotated to any position other than OFF, connect receiver to power source and selects desired receiver function. The positions and functions are as follows:												
	<table> <tr> <th>Position</th><th>Function</th></tr> <tr> <td>STAND BY</td><td>Receiver output disabled but receiver remains ready for instant use.</td></tr> <tr> <td>AGC</td><td>Gain is controlled automatically for normal reception.</td></tr> <tr> <td>MGC</td><td>Agc disabled; gain is controlled manually by RF GAIN control.</td></tr> <tr> <td>CAL</td><td>Calibration oscillator enabled to supply signals at 100-kc points.</td></tr> <tr> <td>SQUELCH</td><td>Squelch circuit connected for silencing receiver when input signal falls below threshold level determined by setting of RF GAIN control. (Normally not used in Radio Receiving Set AN/FRR-39.)</td></tr> </table>	Position	Function	STAND BY	Receiver output disabled but receiver remains ready for instant use.	AGC	Gain is controlled automatically for normal reception.	MGC	Agc disabled; gain is controlled manually by RF GAIN control.	CAL	Calibration oscillator enabled to supply signals at 100-kc points.	SQUELCH	Squelch circuit connected for silencing receiver when input signal falls below threshold level determined by setting of RF GAIN control. (Normally not used in Radio Receiving Set AN/FRR-39.)
Position	Function												
STAND BY	Receiver output disabled but receiver remains ready for instant use.												
AGC	Gain is controlled automatically for normal reception.												
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CAL	Calibration oscillator enabled to supply signals at 100-kc points.												
SQUELCH	Squelch circuit connected for silencing receiver when input signal falls below threshold level determined by setting of RF GAIN control. (Normally not used in Radio Receiving Set AN/FRR-39.)												
ANT, TRIM-----	Provides means of tuning antenna circuit for best reception.												
ZERO ADJ-----	When turned clockwise, disengages frequency indicator from KILOCYCLE CHANGE control for calibration purposes.												
LOCAL GAIN control-----	Controls level of af signal applied to local output terminals.												
RF GAIN control-----	Controls gain of rf and if. amplifiers.												
KILOCYCLE CHANGE control-----	Tunes receiver to any frequency within a band, and changes reading of last three digits on frequency indicator. Frequency range of control is slightly greater than 1 mc; when tuned to frequency higher or lower than that indicated by first two digits, plus or minus sign is displayed in space between mc and kc readings, indicating <i>addition or subtraction of 1 mc in reading of first two digits to obtain true reading.</i>												
DIAL LOCK-----	Locks KILOCYCLE CHANGE control to prevent accidental change of setting.												
MEGACYCLE CHANGE control-----	Selects any one of 32 tuning steps; changes reading of first two digits of frequency indicator.												
OVENS OFF-ON switch-----	Screw driver adjustment. In ON position, 26 volts ac are applied to crystal oven HR401 and vfo oven HR701.												



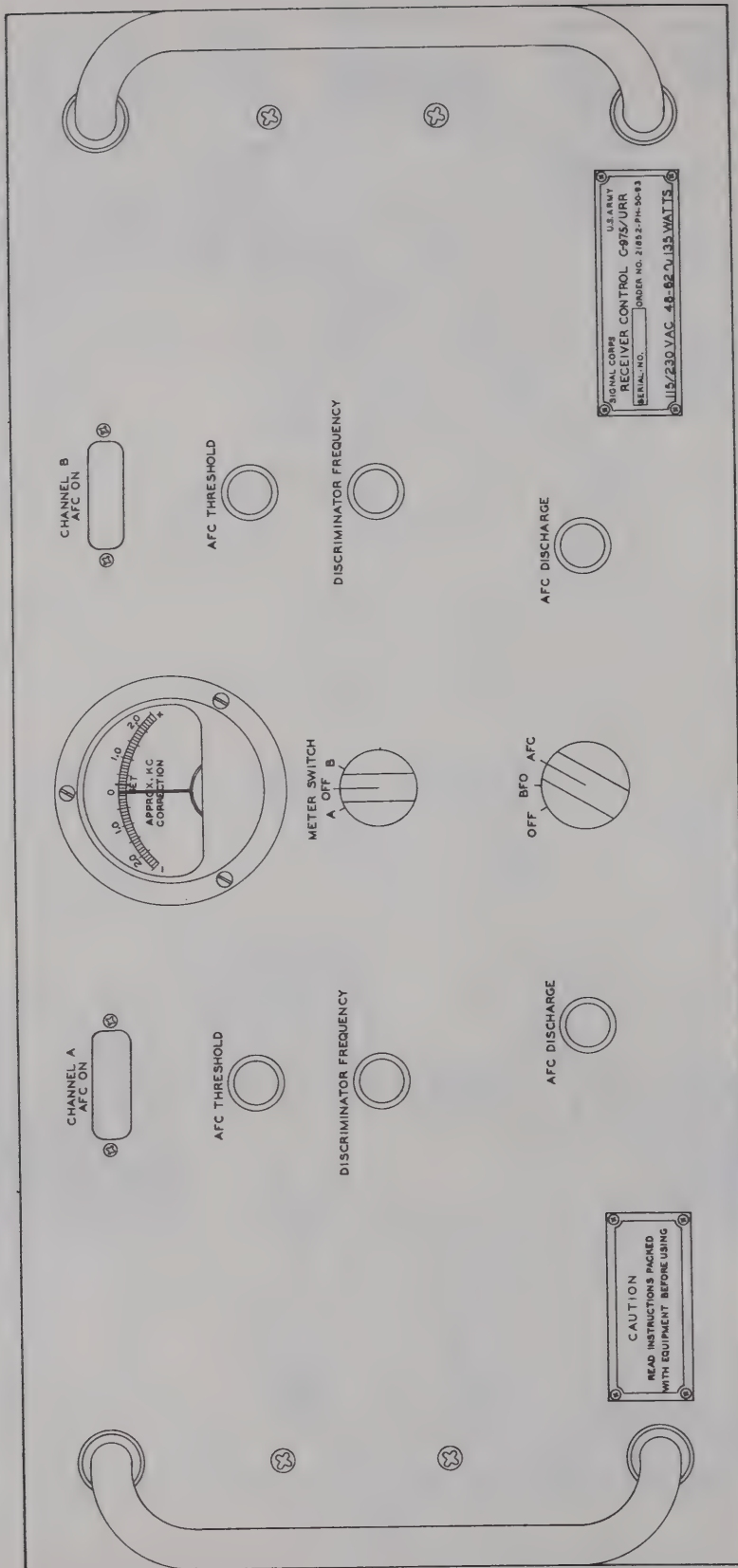
TM 648-23

Figure 23. Radio Receiver R-390/URR, front panel controls.



TM 648-24

Figure 24. Radio Receiver R-390/URR, rear chassis controls.



TM 648-25

Figure 25. Receiver Control C-975/URR, front panel controls.



21. Receiver Control C-975/URR Controls (figs. 25 and 26)

The controls of Receiver Control C-975/URR and their functions are listed in the following chart:

Controls	Function
OFF-BFO-AFC switch	In BFO position, completes circuit for operation of receivers using their internal beat-frequency oscillators; in AFC position, connects afc circuits to each receiver.
CHANNEL A (or B) AFC ON indicator lamp	Indicates functioning of afc circuit.
AFC THRESHOLD control	One potentiometer in each channel to adjust if. input voltage level necessary to operate the afc hold relay circuit.
DISCRIMINATOR FREQUENCY control	One potentiometer in each channel to adjust the audio-output frequency of the receiver control.
AFC DISCHARGE switch	One switch in each channel to short the afc time-delay network when desired.
METER SWITCH A-OFF-B	Completes meter circuit for either channel.
Meter	Indicates approximate correction (in kc) provided by the afc channel selected by METER SWITCH A-OFF-B.
METER ZERO control	Enables meter M1501 to be zeroed under static conditions.
ADJUST FILAMENT control	A potentiometer to adjust the regulated filament voltage to 6.3 volts.

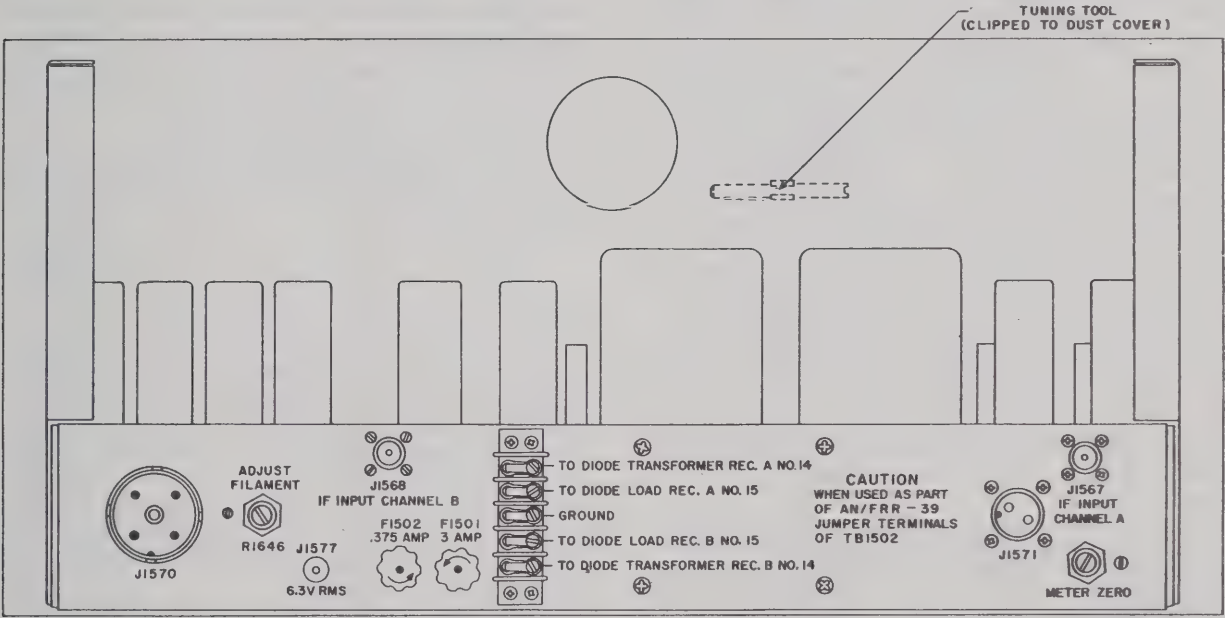


Figure 26. Receiver Control C-975/URR, rear chassis controls.

Section II. INITIAL ADJUSTMENTS

22. Initial Adjustment of Radio Receiver R-390/URR

To maintain the tuning accuracy of the receiver, calibrate the frequency indicator at the point nearest the frequency desired for reception whenever the MEGACYCLE CHANGE control is operated to select another band. Calibration is

accomplished by the use of the internal calibration oscillator as follows:

- a. Set the BANDWIDTH switch to .1-KC position.
- b. Set the AUDIO RESPONSE switch to MED.
- c. Set the RF GAIN control to 10.
- d. Set the LOCAL GAIN control to 5.

- e. Set the BFO switch to ON.
- f. Turn the BFO pitch to 0.
- g. Turn the FUNCTION switch to CAL.
- h. Set OFF-BFO-AFC switch to BFO.
- i. Adjust MEGACYCLE CHANGE and KILOCYCLE CHANGE controls for a reading on the frequency indicator at the 100-kc point nearest the frequency desired for reception.
- j. Turn the ZERO ADJ. control clockwise as far as it will go.
- k. Rotate the ANT. TRIM control to obtain indication on the CARRIER LEVEL meter.
- l. Adjust the KILOCYCLE CHANGE control for a zero beat indication in the headset or loudspeaker.
- m. Turn the ZERO ADJ. control fully counter-clockwise. The dial now is calibrated accurately.

### 23. Initial Adjustment of Receiver Control C-975/URR

The following adjustments should be made after the initial installation, after replacement of a unit for repairs, etc. The adjustments should be checked periodically; the frequency of checking depends on the operating time of the equipment.

- a. Place 115- or 230-volt switch S1503 in the position corresponding to the supply voltage.
- b. Turn OFF-BFO-AFC switch to BFO.
- c. Place the test leads of a 0- to 10-volt iron-vane ac voltmeter (Weston 476, or equal) between 6.3 V RMS test jack J1577 and chassis ground.  
*Note.* If this ac voltmeter is not an iron-vane type meter, an incorrect setting of the regulator filament voltage will result.
- d. Place ADJUST FILAMENT control R1646 in the position to give a 6.3-volt reading on the ac voltmeter.
- e. Place the vertical input leads of an oscilloscope (Oscilloscope OS-8A/U (TM 11-1214) or equal) between B+ 180 V test jack J1569 and chassis ground.
- f. Adjust HUM BALANCE potentiometer R1583 for minimum hum level as indicated by the oscilloscope.
- g. Place METER SWITCH A-OFF-B in the OFF position.
- h. Adjust METER ZERO potentiometer R1579 on the rear panel for a zero meter reading.
- i. Turn OFF-BFO-AFC switch to OFF.

### 24. Preoperational Tests and Adjustments

Perform the preoperational tests and adjustments before operating Radio Receiving Set AN/FRR-39 (pars. 25 through 28). The use of patch cords and the frequency indicator meter of the radioteletype terminal equipment is discussed in TM 11-356, Radioteletype Terminal Equipment AN/FGC-1, AN/FGC-1C, and AN/FGC-1X.

### 25. Afc Threshold Sensitivity Adjustment

This adjustment need not be made every time the radio receiving set is placed in operation, but a periodic check should be made approximately once a month.

- a. Calibrate Radio Receiver R-390/URR at the 900-kc position. Then calibrate a signal generator, such as R. F. Signal Generator Set AN/URM-25, against the radio receiver by feeding a 455-kc signal from the signal generator into the receiver. Tune the receiver to 910 kc. Turn the BFO switch to ON and listen for the resultant beat note. Adjust the signal generator for a zero beat. The second harmonic of the signal generator output actually is being checked in this case.

- b. Couple the output of the calibrated signal generator into IF INPUT CHANNEL A receptacle J1567.

- c. Adjust the signal generator for a 3-millivolt output.

*Note.* This is a voltage under load. A properly terminated signal generator will develop one-half of the open-circuit voltage. Check the technical manual for the signal generator to determine whether the output of the generator is calibrated in terms of open-circuit or properly terminated voltage.

- d. Turn the CHANNEL A AFC THRESHOLD control to the position where CHANNEL A AFC ON lamp just lights.

- e. For CHANNEL B afc threshold sensitivity adjustment, repeat the procedures in a through d above using CHANNEL B controls.

### 26. Frequency Indication Calibration of Radioteletype Terminal Equipment AN/FGC-1( )

The following procedure is for adjusting the frequency indicator circuit so that zero indication is obtained on the meter when the mark frequency received from the receiver is 2,125 cps.

- a. Set the OFF-BFO-AFC control (on the receiver control) to BFO.

*b.* Plug a headset into the PHONES jack of one of the receivers. (Use this receiver throughout the remainder of the procedure in this paragraph.)

*c.* Turn the METER switch (on the frequency indicator) to the D-C position.

*d.* Patch the METER D-C jack (on the frequency indicator) to the FREQ IND OUT jack. Use a cord equipped with three conductor plugs.

*e.* Turn the receiver BFO switch to ON.

*f.* Set the receiver BFO PITCH control to 0.

*g.* Disengage the DIAL LOCK on the receiver.

*h.* Tune the receiver to the teletypewriter signal.

*i.* Adjust the KILOCYCLE CHANGE control until the two tones are the same. This is halfway between the mark and space frequencies.

*j.* Tune the BFO PITCH control (normally clockwise) for a steady indication on the frequency indicator meter. (The proper setting of the BFO PITCH control should be just past 2.)

*k.* Set the receiver LINE GAIN control for a 0-vu output on the LINE LEVEL meter.

*l.* Depress the FREQ IND CAL switch (on the frequency indicator) and hold it operated.

*m.* Adjust the ZERO ADJ control (on the frequency indicator) to obtain a reading of 0 on the meter.

*n.* Release the FREQ IND CAL switch.

*o.* Repeat the operations described in *j* through *n* above.

*p.* Insert the headset into the mark and space channel filter OUT jacks (M CH F and S CH F, respectively) of the proper channel on the detector. Signals should be heard at both jacks.

## 27. Afc Discriminator Frequency Adjustment

The following procedure is for adjusting the afc circuit to maintain the mark frequency close to 2,125 cps. The procedure includes a test to determine whether the spread (difference) between the mark and space frequencies is 850 cps. The procedure is used separately with each receiver. The controls mentioned below are located on Radioteletype Terminal Equipment AN/FGC-1( ) unless otherwise indicated.

*a.* Calibrate the frequency indicator circuit (par. 26) if this has not been done already.

*b.* Turn the BFO switch (on the receiver) to OFF.

*c.* Turn the OFF-BFO-AFC switch (on the receiver control) to AFC position.

*d.* Press and release the AFC DISCHARGE switch (on the receiver control); use the switch for the proper channel.

*e.* Set the LINE GAIN control (on the receiver) for a 0-vu reading on the LINE LEVEL meter.

*f.* Adjust the DISCRIMINATOR FREQUENCY control (on the receiver control) of the proper channel to obtain a zero meter reading on the frequency indicator.

*g.* If the meter reading fluctuates more than  $\pm 5$  during reception, readjust the DISCRIMINATOR FREQUENCY control.

*h.* If the steady meter reading exceeds 15 (+ or -) during the test message, the mark and space frequency spread differs from 850 cps by an unacceptable amount. Request the distant transmitter to make a spread adjustment. The type and magnitude of adjustment necessary is explained in (1) through (3) below.

(1) If the steady reading is to the right (positive), the frequency spread is too great.

(2) If the steady meter reading is to the left (negative), the frequency spread is too small.

(3) Six times the steady meter reading is the departure in cps from the desired (850 cps) frequency spread.

## 28. Receiver Control Bfo Frequency Adjustment

With normal operating conditions, the receiver control bfo frequency should be adjusted at least once a week. Normal aging of the reactance tube (V1508 or V1530) results in a 200- to 350-cps shift in bfo frequency per week of operation (based on continuous operation). This aging process is discussed further in the technical manual covering the receiver control. Proceed as follows to adjust the bfo frequency:

*a.* Calibrate the receivers (par. 22).

*b.* Leave the receiver controls in the position used for calibration.

*c.* Set meter M1501 to zero.

*d.* Set OFF-BFO-AFC switch of the receiver control in the AFC position.



e. Set METER SWITCH A-OFF-B to A.

f. Using the special tool clipped to the dust cover (fig. 26), adjust channel A bfo capacitor C1609 until the kilocycle correction meter reads 0. To gain access to capacitor C1609 (and capacitor C1611 in *h* below) remove the receiver control dust cover.

g. Set METER SWITCH A-OFF-B to B.

h. Adjust channel B bfo capacitor C1611 until the kilocycle correction meter reads 0.

*Note.* A steady signal input may be used in this adjustment instead of using the calibration oscillator in the receiver. In this case, adjust the KILOCYCLE CHANGE control for a maximum indication on the CARRIER LEVEL meter and follow the same procedure as above.

### Section III. OPERATION UNDER USUAL CONDITIONS

#### 29. Preliminary Starting Procedure

Before using the starting procedure given in paragraph 30, set the front panel controls as shown below. Initial adjustments indicated in paragraphs 22 through 28 should be made if necessary.

Component	Control	Position
Radio Receiver R-390/ URR.	FUNCTION-----	OFF
	AGC-----	MED
	LOCAL GAIN-----	5
	RF GAIN-----	10
	BFO-----	OFF
	LIMITER-----	OFF
	BANDWIDTH-----	2 or 4
	ANT. TRIM-----	0
	AUDIO RESPONSE-----	MED
	LINE GAIN-----	5
	LINE METER-----	0
	BREAK IN-----	OFF
	OFF-BFO-AFC-----	OFF
Receiver Control C- 975/URR.		

#### 30. Starting Procedure

**Caution:** The ac power supply of the receiver control and each receiver must be set to the correct ac input voltage.

a. If the equipment is operated under low-temperature conditions, or in a location where there is considerable variation in temperature, set the screwdriver-adjusted OVENS OFF-ON switch on the back panel of each receiver to ON. When the radio receiving set is operated in a temperature-regulated building, set the OVENS OFF-ON switches to OFF. Under high-temperature operating conditions, remove the top and bottom dust covers of the receivers and receiver control to provide adequate ventilation.

b. Set the main ac switch at the bottom of the cabinet (fig. 9) to the ON position.

c. Turn the FUNCTION switch to AGC. Before operating the receivers, allow them to warm up for several minutes.

d. Turn the OFF-BFO-AFC switch of the receiver control to AFC. Allow several minutes warmup time.

*Note.* If, during the starting or operating procedure, an abnormal result occurs, refer to the equipment performance check list (par. 54).

#### 31. Operation

Correct operation of Radio Receiving Set AN/FRR-39 depends, to a great extent, on the experience of the operator and his ability to analyze the operating conditions at any given time. Therefore, the settings of the controls will depend on the operating conditions. A general operating procedure is given in paragraph 32. Various comments, operating precautions, and general operating procedures are discussed in paragraphs 33 through 36.

#### 32. Normal Diversity Operation

a. Disengage the DIAL LOCK control of receiver A.

b. Use the MEGACYCLE CHANGE and KILOCYCLE CHANGE controls to set the frequency-indicator reading to the frequency of the desired station. If a plus or minus sign appears in the space between the megacycle and kilocycle dial readings (because of overtravel of KILOCYCLE CHANGE control) when tuning in an unknown station, the reading of the first two digits must be increased or decreased by 1 mc to arrive at a true frequency.

c. Set METER SWITCH A-OFF-B on the receiver control to A.

d. Press the CHANNEL A AFC DISCHARGE control on the receiver control unit, and hold in. Tune from the high side of the desired frequency until the kilocycle correction meter indicates SET (white mark).

*e.* Release the CHANNEL A AFC DISCHARGE switch.

*f.* Tighten the DIAL LOCK to prevent changing of frequency setting.

*g.* Adjust the ANT. TRIM control for maximum reading on the CARRIER LEVEL meter.

*h.* Adjust the LINE GAIN control for a 0-vu level output.

*i.* Adjust the LOCAL GAIN control for desired volume level.

*j.* Repeat the procedures in *a* through *i* above for receiver B and channel B controls.

### 33. Selection of Receiver Bandwidth

Selection of proper receiver bandwidth will depend on receiving conditions. Ideally, the smallest bandwidth should be used, but the ideal situation seldom will exist. The 2- and 4-KC positions normally will be used. If a clear, low-noise signal is being received, select the 4-KC position to allow for maximum drift of the transmitter frequency. Use the 2-KC position when a nominal amount of interference exists. This still will provide some margin for transmitter error. In cases of extreme interference, the 1-KC position may be used, but careful tuning is required. Do not use the 1-KC position unless all other means fail. The bfo of the receiver, instead of the receiver control, must be used when interference is received. When receiving time-division multiplex signals, use the 4-KC bandwidth. The 2-KC bandwidth may be used if a careful system adjustment and tuning procedure is followed, and the signal is accurately centered in the if. pass band. The 1-KC bandwidth should not be used. The correct selection of the receiver bandwidth becomes a matter of operator experience. The stability of the transmitter, noise conditions, types and intensity of interference, etc., must be taken into account in making the proper selection.

### 34. Use of Receiver Control BFO Position

*a.* When there is interference, Receiver Control C-975/URR will not operate properly. However, operation of the receiving set can be continued without automatic frequency control. To operate the radio receiving set by using the internal bfo of the receiver, proceed as follows:

- (1) Perform the procedures in paragraph 26*a* through *k*.
- (2) Insert the headset into the mark and space channel filter-out jacks (M CH F

and S CH F, respectively) of the proper channel on the detector panel of Radioteletype Terminal Equipment AN/FGC-1( ). Signals should be heard at both jacks.

- (3) Monitor signals on the teletypewriter. If intelligence is not being received, reverse one side of the double plug patch cord between the DETECTOR OUT and the REC REL IN jacks on the jack panel of the terminal equipment.

*b.* Radio Receiving Set AN/FRR-39 is designed for use with radioteletype systems with the mark radio frequency higher than the space radio frequency. To utilize systems where the reverse is true, the BFO position can be used, following a procedure similar to that given in *a* above.

*c.* During conditions of extreme static and noise it may be desirable to use the noise limiter circuits in the receivers. Follow the procedure below.

- (1) Use the BFO position as described in *a* above.
- (2) Rotate the receiver LINE GAIN control fully clockwise.
- (3) Turn the receiver LIMITER control on and rotate the control clockwise until the CARRIER LEVEL meter indicates 0 vu.

*d.* Under certain operating conditions, which are best determined by the skill and experience of the operator, it may be desirable to connect the agc line of the two radio receivers together. The receiver with the better signal will develop more agc voltage than the other receiver and lower the gain of the second receiver. This results in a signal with a better signal-to-noise ratio. Otherwise, signals with low signal-to-noise ratio result in poor operation, because the noise is amplified to the same extent as the signal, giving increased interference. Refer to paragraph 18*a* (3) for the connections that must be made in this case.

### 35. Operating Notes and Precautions

*a.* Rotate the KILOCYCLE CHANGE control slowly when tuning in a station as rapid rotation will make location of the desired station difficult. It is also possible to "pull out" of afc because of the length of the time constants in the receiver control.

*b.* When tuning in a station, be sure to tune the KILOCYCLE CHANGE control to SET (white



mark) and to use the mark frequency rather than the space frequency. This is chiefly a matter of experience. To determine audibly that the mark frequency has been selected by the afc system, proceed as follows:

- (1) Tune in a signal from a radioteletype station (use 850 cps shift) that is sending marks and spaces. Press the AFC DISCHARGE switch of the channel in question. Release the switch and rotate the KILOCYCLE CHANGE control until the kilocycle correction meter indicates minus .7 kc (to the left of center). Listen to the audio note. Under the above conditions, the receiver control has locked to the space frequency. This will result in printing errors.
- (2) Without touching the AFC DISCHARGE control, rotate the KILOCYCLE CHANGE control until the needle indicates +1,000 cps. Press the AFC DISCHARGE control and again listen to the audible note. Under this condition, the receiver control is locked to the mark frequency and is functioning correctly.

*c.* When peaking the CARRIER LEVEL meter, place the AGC control in FAST position.

*d.* When the OFF-BFO-AFC switch is in the AFC position, set the BFO control to OFF. Sufficient bfo leakage may be present in the radio receiver to cause interference.

## Section IV. OPERATION UNDER UNUSUAL CONDITIONS

### 38. General

The operation of Radio Receiving Set AN/FRR-39 may be difficult where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs, instructions are given on procedures for minimizing the effect of these unusual operating conditions.

### 39. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow.

- a.* Handle the equipment carefully.

### 36. Antijamming Instructions

When an operator recognizes that his receiver is being jammed, he will inform his immediate superior officer of this fact promptly. Under no conditions will he cease operating. To provide maximum intelligibility of jammed signals, he will adhere to the operational procedure indicated in *a* through *f* below.

*a.* Operate the receiver as outlined in paragraph 34*a*.

*b.* Adjust the ANT. TRIM control for maximum readable output signal.

*c.* If the noise is severe, adjust the LIMITER control as required.

*d.* When the jamming signal is not too strong, set the FUNCTION switch to MGC and lower the RF GAIN. The interfering signal may be sufficiently reduced to permit part of the desired signal to come through.

*e.* If these steps do not provide some degree of signal separation, request a change in frequency and call sign.

*f.* If the jamming action is such that communication is impossible, the operator should report this fact to his immediate superior and continue to operate.

### 37. Stopping Procedure

To stop the equipment, turn the FUNCTION switch to OFF and the OFF-BFO-AFC switch to OFF. To disconnect power from the radioteletype terminal equipment, the main ac switch must be turned to OFF.

*b.* When equipment which has been exposed to the cold is brought into a warm room, moisture will start to condense on the equipment until it reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. This condition also arises when equipment warms up after a cold night.

### 40. Operation in Tropical Climates

When operated in tropical climates, radio equipment may be installed in tents or huts. When equipment is installed in swamp areas, moisture conditions are more acute than normal in the Tropics. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the tem-



perature of the equipment becomes lower than the surrounding air. When this occurs, dry the equipment thoroughly before the equipment is turned on.

#### **41. Operation in Desert Climates**

*a.* Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measures to insure proper operation of the equipment. When additional ventilation for the equipment is needed, remove the blank panels on the cabinet and the dust covers of the individual components.

*b.* The main problem which arises with equipment operation in desert areas is the large amount of sand or dust and dirt which enters the parts of radio equipment. The ideal preventive precaution is to house the equipment in a dust-

proof shelter. Since such a building is seldom available and would require air conditioning, the next best precaution is to make the building in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors, cover the inside walls with heavy paper, and secure the side walls of tents with sand to prevent their flapping in the wind.

*c.* Never tie power cords, signal cords, or other wiring connections to either the inside or the outside of tents. Desert areas are subject to sudden wind squalls which may jerk the connections loose or break the lines.

*d.* Be sure to keep the equipment as free of dust as possible. Make frequent preventive maintenance checks (pars. 44 through 47).

## CHAPTER 4

### ORGANIZATIONAL MAINTENANCE

#### Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

##### 42. Tools and Materials Supplied

No tools and materials are furnished as part of Radio Receiving Set AN/FRR-39. Special tools located on the rear of each radio receiver are furnished with each receiver. Refer to the technical manual covering Radio Receiver R-390/URR.

##### 43. Tools, Materials, and Test Equipment Required

The following tools and materials are required for organizational maintenance procedures.

###### *a. Tools.*

Tool Equipment TE-41.

###### *b. Materials.*

Carbon tetrachloride.<sup>1</sup>

Cheesecloth, bleached, lint-free.<sup>1</sup>

Paper, sand, flint No. 000.<sup>1</sup>

Solvent, Dry Cleaning (SD) (Fed. spec. No. P-S-661a).

###### *c. Test Equipment.*

Electronic Multimeter TS-505/U.

<sup>1</sup> Part of Tool Equipment TE-41.

#### Section II. PREVENTIVE MAINTENANCE SERVICES

##### 44. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from troubleshooting and repair since its object is to prevent certain troubles from occurring. Refer to AR 750-5, Maintenance of Supplies and Equipment, Maintenance Responsibilities and Shop Operation.

##### 45. General Preventive Maintenance Techniques

- a.* Use No. 000 sandpaper to remove corrosion.
- b.* Use a clean, dry, lint-free cloth or a dry brush for cleaning.
  - (1) If necessary, except for electrical contacts, moisten the cloth or brush with solvent (SD); then wipe the parts dry with a cloth.
  - (2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a cloth.

**Caution:** Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous.

Make sure adequate ventilation is provided.

*c.* If available, dry compressed air may be used at a line pressure not exceeding 35 pounds per square inch to remove the dust from inaccessible places; be careful, however, or mechanical damage from the air blast may result.

*d.* For further information on preventive maintenance techniques, refer to TB SIG 178, Preventive Maintenance Guide for Radio Communication Equipment.

##### 46. Use of Preventive Maintenance Forms (figs. 27 and 28)

*a.* The decision as to which items on DA Forms 11-238 and 11-239 are applicable to this equipment is a tactical decision to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

*b.* Circled items in figures 27 and 28 are partially or totally applicable to Radio Receiving Set AN/FRR-39. References in the ITEM block refer to paragraphs in text which contain additional maintenance information.

**OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT**  
**RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR**

**INSTRUCTIONS:** See other side

EQUIPMENT NOMENCLATURE

EQUIPMENT SERIAL NO.

**LEGEND FOR MARKING CONDITIONS:** ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.  
**NOTE:** Strike out items not applicable.

**DAILY**

NO.	ITEM	CONDITION						
		S	M	T	W	T	F	S
①	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories). PAR. 47a (1)							
②	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 47a (2)							
③	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 47a (3)							
④	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 47a (4)							
⑤	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 47a (5)							
⑥	CHECK FOR NORMAL OPERATION. PAR. 47a (6)							

**WEEKLY**

NO.	ITEM	COND- ITION	NO.	ITEM	COND- ITION
⑦	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 47a (7)	13		INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
⑧	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 47a (8)	14		CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 47a (11)	
⑨	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 47a (9)	15		INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 47a (12)	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.	16		INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER-PROOFING. PAR. 47a (13)	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	17		CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
⑫	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWER-STATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 47a (10)	18		CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	
⑬	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 47a (14)				

**DA FORM 11-238**  
1 MAY 51

REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

**TM 648-27**

Figure 27. DA Form 11-238.



SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT			
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, KADAR			
INSTRUCTIONS: See other side			
EQUIPMENT NOMENCLATURE		EQUIPMENT SERIAL NO.	
LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ① Defect corrected. NOTE: Strike out items not applicable.			
NO.	ITEM	NO.	ITEM
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories). PAR. 47 a (1)	19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTIONS, CRACKED SOCKETS; INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 47 a (1)
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 47 a (2)	20	INSPECT FIRM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 47 a (3)	21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 47 a (2)
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUG-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 47 a (4)	22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND RINGE PARTS. PAR. 47 a (3)
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 47 a (5)	23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 47 a (4)
6	CHECK FOR NORMAL OPERATION. PAR. 47 a (6)	24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 47 a (5)
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 47 a (7)	25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS. PAR. 47 a (6)
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 47 a (8)	26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 47 a (7)
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 47 a (9)	27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 47 a (8)
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.	28	CHECK SETTINGS OF ADJUSTABLE RELAYS.
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 47 a (9)
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYKS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 47 a (10)	30	INSPECT GENERATORS, AMPLIFIERS, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 47 a (10)
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 47 a (11)	32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 47 a (11)
15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 47 a (12)	33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 47 a (13)	34	INSPECT CATHODE RAY TUBES FOR BURNED SCREEN SPOTS.
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS.
37		37	MOISTURE AND FUNGIPROOF. PAR. 47 a (12)
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.		PAR. 47 a (13)

DA FORM 11-239

REPLACES DA AGO FORM 919, 1 DEC 50, WHICH IS OBSOLETE.

16-64382-1

TM 648-28

Figure 28. DA Form 11-239.

## 47. Performing Preventive Maintenance

**Caution:** Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they were designed will be damaged or broken.

### *a. Performing Exterior Preventive Maintenance.*

- (1) Check for completeness and satisfactory condition of the radio receiving set. The components of the radio receiving set are listed in paragraph 7.
- (2) Check suitability of location and installation for normal operation (par. 15).
- (3) Remove dirt and moisture from all jacks, plugs, and panels of the components in the radio receiving set.
- (4) Inspect the seating of fuses and connectors on the rear of the components (figs. 5 and 7).
- (5) Check the controls of the receivers and receiver control for binding, scraping, and excessive looseness (figs. 4 and 6).
- (6) Check the radio receiving set for normal operation. If abnormal results occur at any point in the operating procedure, refer to the equipment performance check list (par. 54).
- (7) Clean and tighten the cables and connectors of all the components in the system (fig. 15).
- (8) Inspect the cabinet, chassis, and exposed metal parts for rust corrosion, and moisture.
- (9) Inspect cables for cuts, breaks, fraying, deterioration, kinks, and strains (fig. 15).
- (10) Inspect the following for looseness: switches, knobs, indicator lamps, and meters (figs. 4 and 6).
- (11) Clean the nameplates, caution plates, meter faces, and indicator lamps (figs. 4 and 6).
- (12) Inspect meter glasses and cases for possible damage (figs. 4, 6, and 7).
- (13) Inspect the operating shelter for adequacy of weatherproofing.

- (14) If deficiencies noted are not corrected during inspection, indicate action taken for correction.

### *b. Performing Interior Preventive Maintenance.*

**Caution:** Disconnect all power before performing the following operations. Upon completion, reconnect power and check for satisfactory operation.

*Note.* Refer to the interior preventive maintenance checks in the manuals covering Radio Receiver R-390/URR and Receiver Control C-975/URR for additional information.

- (1) Inspect electron tubes for loose envelopes and cracked sockets; check for insufficient socket spring tension; remove dirt and dust carefully; check emission of receiver type tubes (figs. 18, 19, and 20).
- (2) Inspect fixed capacitors for leaks, bulges, and discoloration.
- (3) Inspect relay assemblies for loose mountings.
- (4) Inspect variable capacitors for dirt, moisture, misalignment of plates, and loose mountings.
- (5) Inspect resistors and insulators for cracks, chipping, discoloration, and moisture.
- (6) Inspect terminals of large fixed capacitors and resistors for corrosion, dirt, and loose contacts.
- (7) Clean and tighten switches, terminal boards, and interior of chassis.
- (8) Inspect terminal blocks for loose connections, cracks, and breaks (figs. 5 and 7).
- (9) Lubricate the equipment in accordance with instructions given in paragraph 48.
- (10) Clean and tighten connections and mountings of transformers and potentiometers.
- (11) Inspect transformers for overheating.
- (12) Check adequacy of moistureproofing and fungiproofing treatment (par. 49).
- (13) If deficiencies noted are not corrected during the inspection, indicate what action was taken to correct the deficiencies.

### Section III. LUBRICATION AND WEATHERPROOFING

#### 48. Lubrication

*a. Lubrication of Receiver Control C-975/URR.* No lubrication is required for Receiver Control C-975/URR.

*b. Lubrication of Radio Receiver R-390/URR.* No lubrication is to be performed at organizational level. Lubrication instructions performed by authorized personnel at field maintenance level may be found in the technical manual for the Radio Receiver R-390/URR.

#### 49. Weatherproofing

*a. General.* Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

*b. Tropical Maintenance.* A special moisture-proofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained in TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, and TB SIG 72, Tropical Maintenance of Ground Signal Equipment.

*c. Arctic Maintenance.* Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained in TB SIG 66, Winter

Maintenance of Signal Equipment, and TB SIG 219, Operation of Signal Equipment at Low Temperatures.

*d. Desert Maintenance.* Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained in TB SIG 75, Desert Maintenance of Ground Signal Equipment.

#### 50. Rustproofing and Painting

*a.* When the finish on the panel has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use No. 00 or No. 000 sandpaper to clean the surface down to the bare metal; obtain a bright, smooth finish.

**Caution:** Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of circuits.

*b.* When a touchup job is necessary, remove loose paint and apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations. Instructions for refinishing badly marred panels and cabinets are given in TM 9-2851, Painting Instructions for Field Use.

### Section IV. TROUBLESHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

#### 51. General

The troubleshooting and repair work that can be performed at the organizational level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued. Accordingly, troubleshooting is based on the performance of the equipment and the use of the senses and substitution techniques in determining which part is at fault.

#### 52. Troubleshooting Procedures

The first step in servicing the equipment is to sectionalize the fault. Sectionalization means tracing the fault to the major component or circuit responsible for the abnormal operation of the set. The second step is to localize the fault. Lo-

calization means tracing the fault to a defective part, such as an open capacitor, burned-out resistor, etc. Some faults, such as a shorted transformer, a burned-out resistor, etc., often can be located by sight, smell, and hearing. The majority of faults, however, must be localized *by checking voltage and resistance*. In troubleshooting Radio Receiving Set AN/FRR-39, once the fault has been sectionalized to a particular unit, refer to the technical manuals covering Radio Receiver R-390/URR and Receiver Control C-975/URR to localize the trouble in the defective unit.

*a. Visual Inspection.* When failures are encountered and the cause is not immediately apparent, check as many of the items below as is practicable before starting a detailed examination of



the components. If possible, obtain information from the operator of the equipment regarding performance at the time the trouble occurred. Failure of this equipment to operate properly usually will be caused by one or more of the following faults.

- (1) Burned-out fuse.
- (2) Defective tube.
- (3) Faulty input connections.
- (4) Faulty output connections.
- (5) Faulty power cable.
- (6) Line voltage low or not applied.
- (7) Defective receivers.
- (8) Grounded or broken antenna or antenna lead-in.

*b. System Sectionalization.* System sectionalization consists of determining whether the trouble is in the receiver control, one of the receivers, power source, antenna system, or interconnection.

- (1) Operate the radio receiving set and observe its performance. See equipment performance check list (par. 54) for normal operating indications.
- (2) If the entire set is dead, the trouble is probably in the power source or cabinet power connections.
- (3) If only one unit is dead, the trouble is probably in that unit. A blown fuse is the normal cause. Do not continue to burn out fuses before looking elsewhere to determine the basic source of trouble.
- (4) The antenna and antenna lead-in can be checked by observing the CARRIER LEVEL meter of each receiver. Each receiver should give some indication of input signal when tuned to a known station. Interchanging the antenna lead-ins and checking results can determine which antenna system, if any, is defective.
- (5) If one receiver exhibits unsatisfactory performance, such as excessive noise, howling, or weak signals, replace it with a good receiver. If the trouble disappears, the replaced receiver is defective. If the trouble persists, the receiver is not at fault.
- (6) If the audio signal supplied to the teletypewriter equipment drifts in frequency or disappears, place the receiver control OFF-BFO-AFC switch in BFO position and use the bfo of the receivers as described in paragraph 34. If the trouble

disappears, the receiver control or connecting cabling is at fault.

- (7) If the receivers are operating properly, but there is no indication on the kilocycle correction meter in one channel position, the defect is in the cabling between the receiver and the receiver control unit, or within the receiver control. Interchanging the cables may determine which is defective. If there is a defect within the control unit, refer to troubleshooting procedure in the technical manual.
- (8) If the equipment works properly with the receiver control OFF-BFO-AFC switch in the AFC position but not in the BFO position, the trouble lies in the receiver's bfo section.
- (9) If the equipment is operative, but the CHANNEL A (or B) AFC ON lamp does not light, the receiver may be mistuned or the AFC THRESHOLD control may not be adjusted properly. Tune the receiver properly and adjust the afc threshold sensitivity as described in paragraph 25.
- (10) If the equipment is operating, but the information is not printing properly, it may be that the afc circuits are locked to the space frequency, or the transmitter is using a shift other than the standard 850 cps. In the former case, retune the equipment and refer to paragraph 35. If the latter case is probable, follow the procedure given in paragraph 27.

*c. Intermittents.* In all of these tests the possibility of intermittents should not be overlooked. If present, this type of trouble may be made to appear or disappear by tapping or jarring the set or unit. It is possible that the trouble is not in a particular unit but in the installation, or the trouble may be caused by external conditions. In this event, test the complete installation, if possible.

## **53. Troubleshooting by Using Equipment Performance Check List**

*a. General.* The equipment performance check list (par. 54) will help the repairman to locate trouble in the equipment. The list gives the items to be checked, the conditions under which the item is checked, the normal indications of correct operation, and the corrective measures to be taken.

To use this list, follow the items in numerical sequence.

*b. Action or Condition.* For some items, the information given in the action or condition column consists of the settings of various switches and controls under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the normal indication column.

*c. Normal Indications.* The normal indications listed include the visible and audible signs that

the repairman should perceive when he checks the items. If the indications are not normal, the operator or repairman should apply the recommended corrective measures.

*d. Corrective Measures.* The corrective measures listed are those the operator or repairman can make without turning in the equipment for repairs. If communication must be maintained, and the equipment is not completely inoperative, the operator must maintain it in operation as long as it is possible to do so.

## 54. Equipment Performance Check List

	Item No.	Item	Action or condition	Normal indications	Corrective measures
P R E P A R A T O R Y	1	Antennas.....	Lead-in cables connected.		
	2	600-ohm line to teletype-writer equipment.	Connected to terminals 10 and 13 of terminal board TB101 on each receiver.		
	3	If. cables.....	Connected between J106 of each receiver and J1567 or J1568 of receiver control.		
	4	Audio output cables.....	Connected between terminals of TB1501 on receiver control and terminals 14, 15, and 16 of TB101 on each receiver.		
	5	Power cables.....	Connected between power source and each component.		
	6	AUDIO RESPONSE switch.	Set to MED.		
	7	RF GAIN control.....	Set at 10.		
	8	BANDWIDTH switch....	Set at 4.		
	9	LOCAL GAIN control....	Set at 5.		
	10	Terminal boards TB101 and TB102.	The following pairs of terminals on the rear terminal boards of each receiver are either connected together or connected to auxiliary circuitry; 1 and 2, 3 and 4, and 11 and 12.		
	11	LINE GAIN control.....	Set at 5.		
	12	ANT. TRIM.....	Set at 0.		
S T A R T	13	Main ac power switch....	Set to the ON position.		
	14	FUNCTION switch.....	Turn to AGC.....	Dial lamp lights.....  Signal or rushing noise heard in headphones.	Check power source and power cable. Check dial light and fuse F101 (Ac 3A).* See paragraph 52b.*

See footnote at end of table.

## 54. Equipment Performance Check List—Continued

	Item No.	Item	Action or condition	Normal indications	Corrective measures
START	15	OFF-BFO-AFC switch (on receiver control unit).	Turn to AFC-----	Tube filaments light-----  Audio output is heard in receiver headphones.	Check power source and power cables. Check fuse F1501 (3 Amp).* Check interconnections. Rotate OFF-BFO-AFC switch several times to clean contacts. See paragraph 52b.
EQUIPMENT PERFORMANCE	16	MEGACYCLE CHANGE control.	Set to each band, in turn.	Normal signal output on each band.	(*).
	17	KILOCYCLE CHANGE control.	Tune across a band-----	Signals received. CARRIER LEVEL meter indicates strength of signal. Kilocycle correction meter indicates correction of radioteletype signals.	(*).
	18	ANT. TRIM control-----	Rotate control-----	Obtain peak reading on CARRIER LEVEL meter for each band.	(*).
	19	LOCAL GAIN control---	Rotate control in either direction.	Volume at headphones increases or decreases.	(*).
	20	LINE GAIN control---	Rotate control-----	Output level to radioteletype equipment varies. At low gain, printer will not operate.	(*).
	21	RF GAIN control-----	Rotate control-----	Audio output and CARRIER LEVEL meter indication increases or decreases. Kilocycle correction meter indicates zero with control in counter-clockwise position and printer does not function.	(*).
	22	FUNCTION switch-----	Turn to CAL, and then operate the KILOCYCLE CHANGE control.	Deflection on CARRIER LEVEL meter at each 100-kc reading.	(*).
	23	LINE METER switch---	Turn to +10-----	Line level is 10 vu above LINE METER indications.	(*).
			Turn to 0-----	LINE METER indicates the line level controlled by the LINE GAIN control.	
			Turn to -10-----	Line level is 10 vu below LINE METER indication.	
			Turn to off-----	LINE LEVEL meter is disconnected. Line audio output is still connected.	

See footnote at end of table.



## 54. Equipment Performance Check List—Continued

	Item No.	Item	Action or condition	Normal indications	Corrective measures
EQUIPMENT PERFORMANCE	24	BANDWIDTH switch--	Turn from 16 to .1 KC--	Selectivity becomes sharper. If equipment is mistuned slightly, printer will not operate in .1 KC position.	(*).
	25	OFF-BFO-AFC switch, BFO OFF-ON control, and BFO PITCH switch.	Turn to BFO, turn BFO control ON, tune in radioteletype signal and vary BFO PITCH control. Return controls to previous position after this check.	Receiver control does not function; as BFO PITCH control is varied, printer will function at one position only.	Check cabling.*
	26	METER SWITCH A-OFF-B.	Turn to A (or B)-----	Meter indicates correction in kilocycles provided by afc channel selected.	Note if AFC ON lamps are lighted. If afc circuit is functioning, but meter does not indicate, trouble is in the meter circuit.*
	27	CHANNEL A (or B) AFC DISCHARGE switch.	Push in control corresponding to afc channel position of meter switch.	Needle on meter returns to zero during time control is held in.	
	28	CHANNEL A (or B) DISCRIMINATOR FREQUENCY control.	Rotate control-----	Audio note in receiver headset varies in frequency. Needle of meter will follow rotation.	
	29	CHANNEL A (or B) AFC THRESHOLD control.	Rotate control fully counterclockwise.	CHANNEL A (or B) AFC ON lamp will go out. Afc circuits will function for several minutes and then bfo will return to 457.125 kc. If input signal then drifts, afc circuits will not correct resultant audio drift.	See paragraph 52b.*
STOP	30	FUNCTION switch-----	Turn to STAND BY-----	Receiver is silent. Filament circuits and oscillator circuits are kept on for immediate reception.	(*).
			Turn to OFF-----	Turns off all receiver circuits.	
	31	OFF-BFO-AFC switch-----	Turn to OFF-----	Turns off all receiver control circuits.	(*).
	32	Main ac power switch-----	Set to the OFF position---		

\*This trouble cannot be corrected during operation and reference to either the receiver or the receiver control unit technical manual must be made.

## CHAPTER 5

### SYSTEM THEORY

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#### Section I. DIVERSITY RECEPTION

##### 55. General

Diversity reception is the name given to a system of radio reception in which two or more receivers with separate antennas are used to minimize the effects of fading. Radio Receiving Set AN/FRR-39 (fig. 29) uses two antennas and receivers. The antennas are separated by a distance of approximately 600 feet. Both receivers are tuned to the same frequency and receive the same signal. The outputs of the two receivers are fed to Radioteletype Terminal Equipment AN/FGC-1( ), which provides diversity combining of the two signals to insure the best possible reception.

##### 56. Explanation of Fading

The term fading, as discussed in connection with diversity reception, is used to denote variations in signal strength over periods of a fraction of a second to several minutes duration. The term does not refer to the slow, hour-to-hour, day-to-night, day-to-day, or seasonal variations in signal strength. It is generally agreed that signal fading is caused by the fact that radio waves propagated from a transmitter may travel over two or more paths between the transmitting and receiving antenna. Differences in the lengths of these paths cause the signals arriving at a receiving antenna to have varied phase relationships. These variations in phase frequently result in either complete or partial addition or cancellation of the signal potential.

a. The distance traveled by the signal is controlled principally by three factors:

- (1) Distance between transmitting and receiving antennas.
- (2) Frequency of the transmitted signal.
- (3) Instantaneous height of the ionosphere above the surface of the earth.

b. The first two factors are constant for a given signal, but the third is variable with continuously changing ionospheric conditions.

##### 57. Elimination of Fading

In the diversity system of reception, the receiving antennas are spaced several wave lengths apart. This makes it extremely unlikely for cancellation of the received signal to occur in both antennas at the same instant. One antenna or the other, therefore, generally will have a sufficiently strong signal to operate the radio receiving set. The signal from each antenna is fed to a separate receiver, and the detected outputs of the receivers are applied to radioteletype terminal equipment. The terminal equipment diversity combines the two signals and uses the resultant to operate the automatic printing equipment associated with the system. The final output of the system is derived from the voltage induced on one antenna only, although the selection of separate antennas may change quickly with fading conditions.

#### Section II. SYSTEM OPERATION

##### 58. General

a. The radio transmitter sends out its normal frequency when the contacts of the teletypewriter-sending mechanism are closed (mark condition). When the contacts are opened (space condition), the rf carrier is reduced 850 cps in frequency; the

amplitude remains unchanged. To transmit mark and space signals at the same power level, the normal frequency (mark) is 425 cps above the assigned frequency.

b. The doublet or rhombic antennas feed the incoming frequency-shift signals to their respective

receivers, where the carrier frequency is converted to a 455-kc intermediate frequency. The if. signal, taken from the if. output circuit of each receiver, is fed to each channel of a receiver control, which acts as a dual channel afc device. The receiver control converts the if. signal to audio frequencies of 2,125 cps for mark signals and 2,975 cps for space signals, and it provides automatic frequency control of the audio signals. The audio signals are fed back to each receiver where they are amplified. The audio output is applied to radioteletype terminal equipment, which provides diversity combining and produces dc pulses for operation of teletypewriter equipment.

## 59. Block Diagram

The block diagram in figure 29 indicates the signal path in the radio receiving set. Signal voltage developed in the antenna is amplified by two rf stages in Radio Receiver R-390/URR. Triple conversion is used on the lowest eight frequency bands to obtain a 455-kc if. signal. Double conversion is used on all other bands. The 455-kc signal then is applied to Receiver Control C-975/URR input. In the receiver control, the signal is mixed with a bfo operating at 457.125 kc to obtain a 2,125 cps audio output (mark condition). (When the carrier shifts in frequency the audio output is 2,975 cps (space condition).) If the 455-kc input signal drifts off frequency, the afc circuits of the receiver control function to change the operating frequency of the bfo, thus keeping the audio-output frequency at 2,125 cps. The audio signal then is fed back to each receiver. The output signals taken from the line audio outputs of Radio Receiver R-390/URR are applied

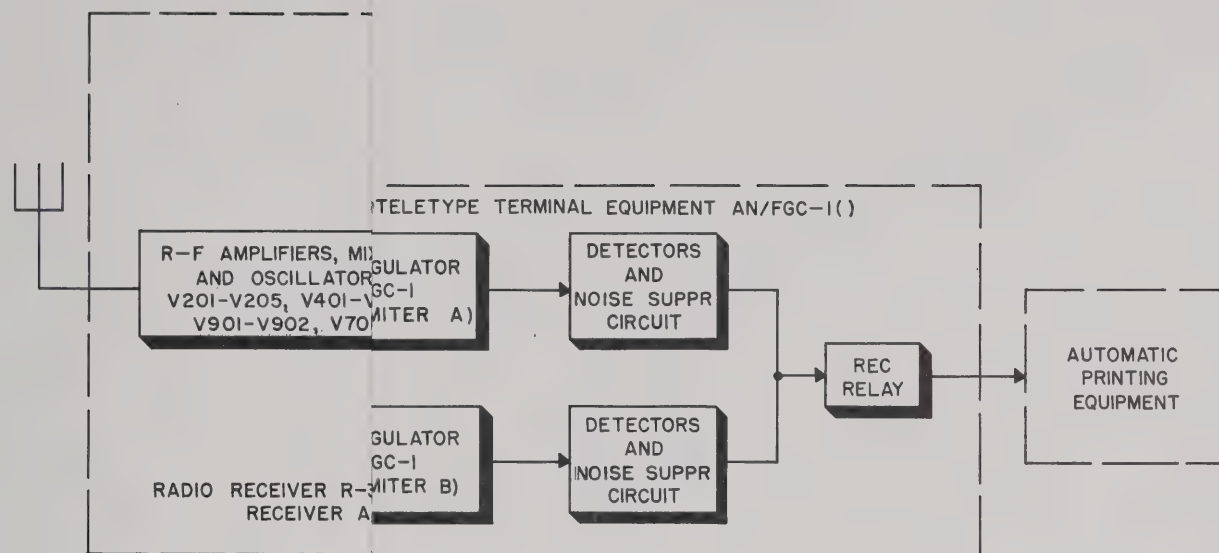
to Radioteletype Terminal Equipment AN/FGC-1( ), which provides diversity combining and produces dc pulses for operation of automatic printing equipment. Each component in Radio Receiving Set AN/FRR-39 has its own power supply.

## 60. Control Circuits

*a. Bfo-Afc Operation* (fig. 30). Radio Receiving Set AN/FRR-39 may operate with or without afc circuits, depending on the position of the OFF-BFO-AFC switch of Receiver Control C-975/URR. In the BFO position, output of detector stage V507A of each receiver is coupled through Electrical Special Purpose Cable Assembly CX-2753/U (one cable for each receiver) to the receiver control, through contacts of the OFF-BFO-AFC switch, back through the cable to the diode load of the receivers. The bfo of each receiver then must be operated for proper teletypewriter reception. In the AFC position, the bfo for each receiver is furnished by the receiver control. A schematic diagram of the switch circuit is shown in figure 30.

*b. Power Distribution Circuits.* Ac power to the radio receiving set is supplied through a switch box located near the bottom of the cabinet. Individual units are plugged into receptacles mounted in a distribution strip. Ac power to the radioteletype terminal equipment is fed through a junction box (fig. 2). To disconnect power from the radioteletype terminal equipment, the main power switch in the cabinet must be placed in the OFF position. An ac distribution diagram is shown in figure 31.





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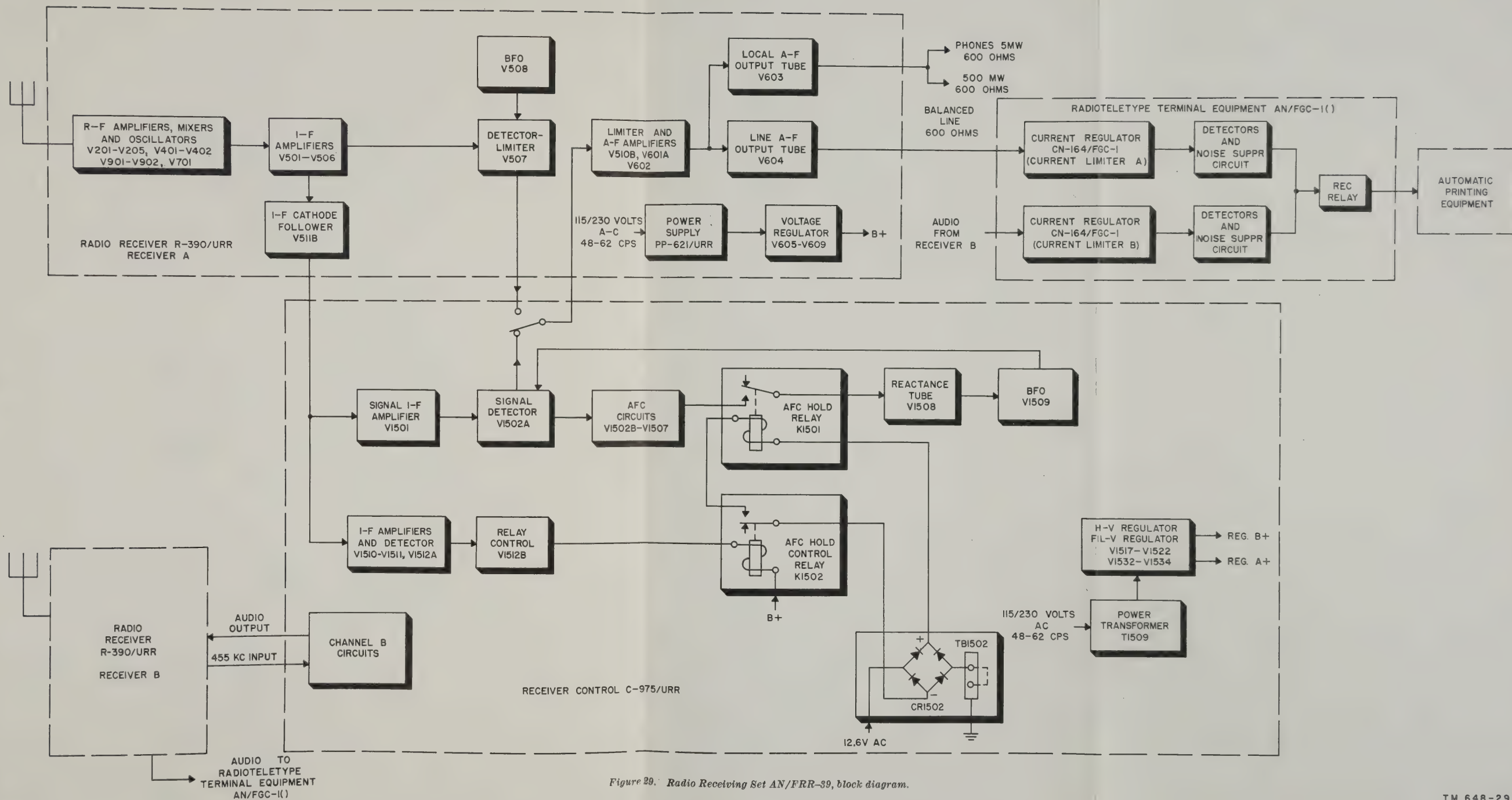
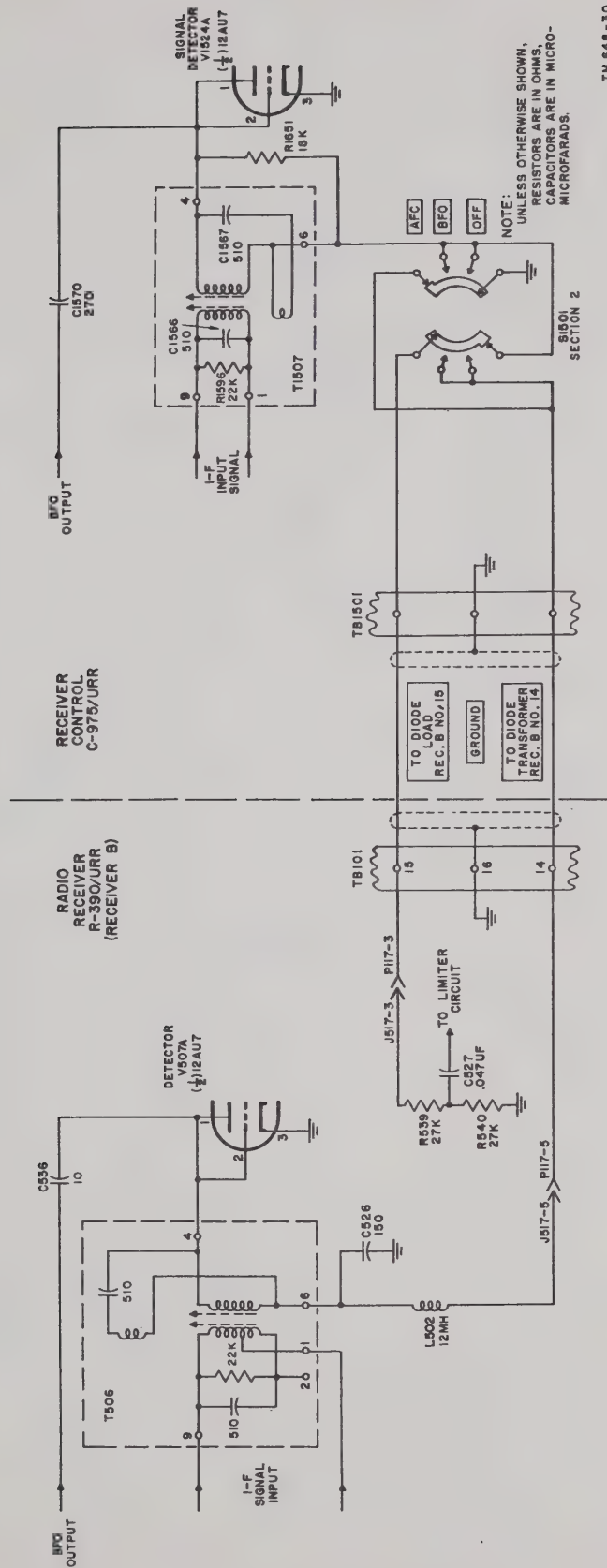


Figure 29. Radio Receiving Set AN/FRR-39, block diagram.

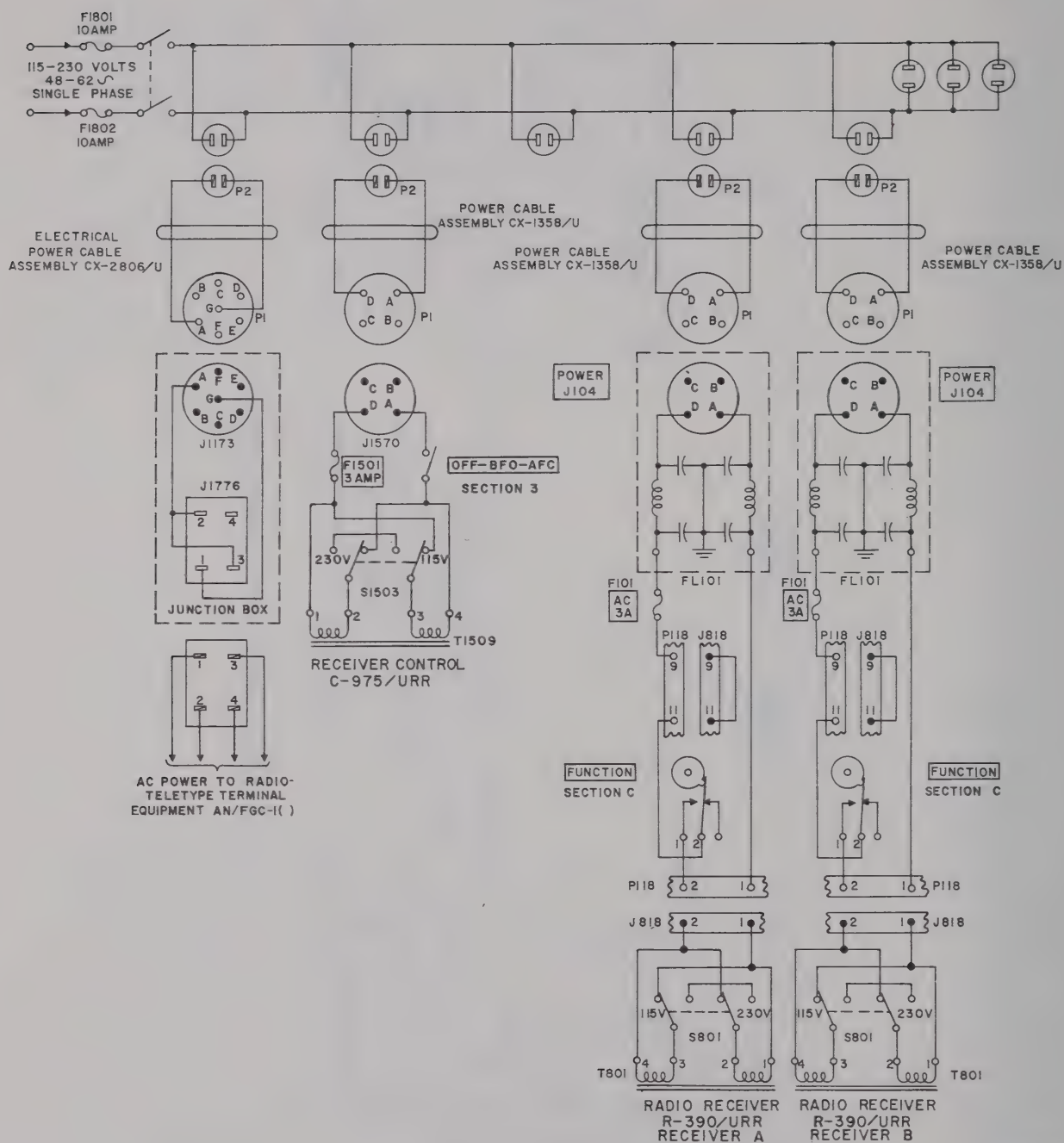






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Figure 30. Bfo-afc control circuit, schematic diagram.

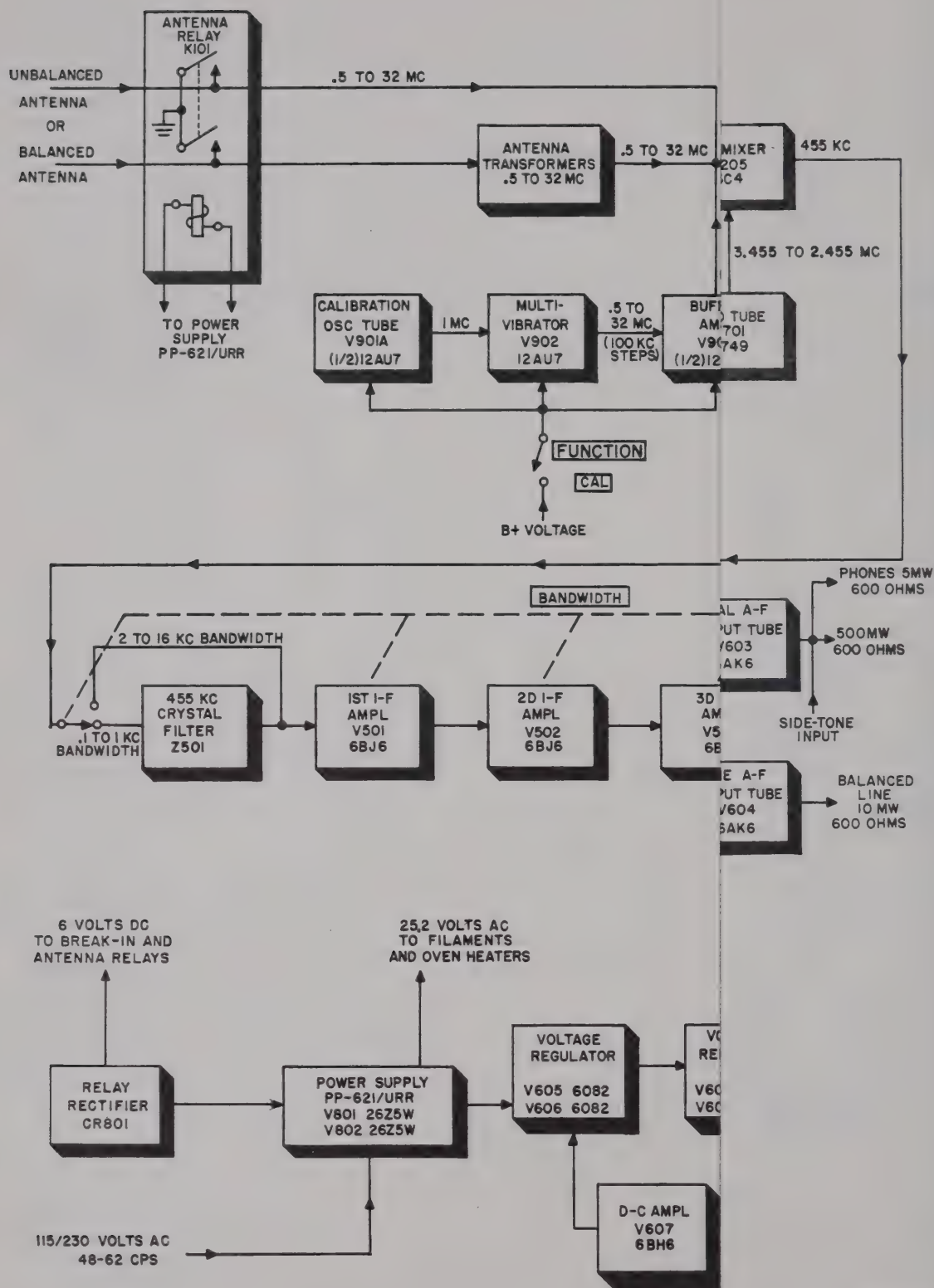


TM 648-31

Figure 31. Power distribution circuits, schematic diagram.







TM 648-32

## CHAPTER 6

### UNIT THEORY

#### Section I. THEORY OF RADIO RECEIVER R-390/URR

##### 61. General

*a.* Radio Receiver R-390/URR provides reception of cw, mcw voice, and frequency-shift keyed signals over a frequency range of .5 to 32 mc. The receiver is basically a superheterodyne of the multiple conversion type. Triple conversion is used for the lower frequencies (.5 to 8 mc) and double conversion for the higher frequencies (8 to 32 mc).

*b.* The receiver normally operates from a self-contained power supply designed to operate at a nominal input of 115 or 230 volts over a frequency range of 48 to 62 cps.

*c.* The tuning system of Radio Receiver R-390/URR provides linear tuning over the entire frequency range of the receiver. Permeability tuning (insertion of powdered iron cores into coils) and a system of gears and cams make possible linear tuning and the use of a counter-type indicator on the front panel to show the frequency selected.

##### 62. Block Diagram

(fig. 32)

*a.* The block diagram shows the signal path from the antenna to the output. The schematic diagram (fig. 34) shows details of the circuits in the same order.

*b.* Power Supply PP-621/UR provides dc for the antenna and break-in relays, ac to the filament and oven circuits, and B+ voltage to the voltage-regulator circuit. All B+ voltages supplied to the receiver are regulated. The voltage-regulator circuit consists of series regulators V605 and V606, dc amplifier V607, and voltage-reference tubes V608 and V609. The power supply consists of a transformer, with two primary windings connected in series for 230-volt ac operation or connected in parallel for 115-volt ac operation (fig. 31) and rectifiers V801 and V802. Dc voltage for

the break-in relay circuit is provided by dry-disk rectifier CR801.

*c.* Rf signals are fed to the receiver from either a balanced or unbalanced antenna. Antenna relay K101 grounds the antenna input for break-in operation and during calibration. This relay also operates to protect the antenna circuits of the receiver during standby operation. If the balanced antenna input is used, the rf signals pass through one of several antenna transformers (selection of which is determined by the operating frequency of the receiver) and are fed to first rf amplifier V201. If the unbalanced antenna input is used, the signals are capacitor coupled to the secondary of the antenna transformers and are applied to first rf amplifier V201.

*d.* The calibration oscillator subchassis, composed of V901 and V902, supplies a signal at every 100-kc point within the frequency range of the receiver. A 1,000-kc crystal-oscillator stage, one-half of V901, provides a signal for synchronizing multivibrator stage V902 at 100 kc. A buffer-amplifier stage, one-half of V901, isolates the multivibrator from the loading effects of the rf circuit and increases the strength of the higher 100-kc harmonics. When the FUNCTION switch is in the CAL position, B+ voltage is connected to the calibration oscillator circuits and the calibrating signal is applied to the first rf amplifier.

*e.* The output of first rf amplifier V201 is coupled to the grid of second rf amplifier V202. The gain of the first and second rf amplifiers is controlled manually by the RF GAIN control and automatically by the automatic gain control voltage. These stages amplify the rf signals before applying them to the mixer circuits. The output of the second rf amplifier (.5 to 32 mc) is fed to either the first or second mixer, depending on the MEGACYCLE CHANGE control setting. For frequencies from .5 to 8 mc, the rf signal is mixed



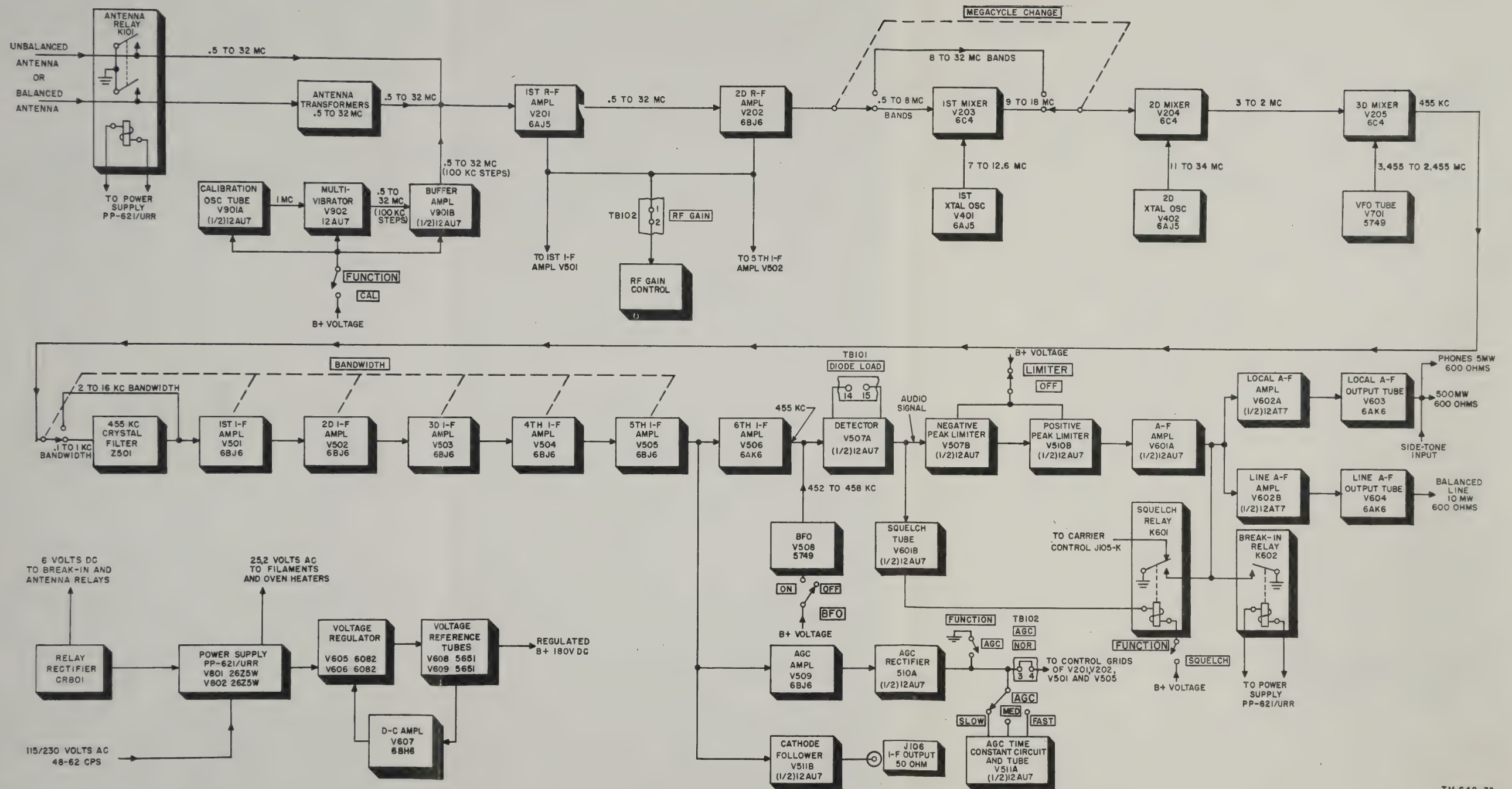


Figure 32. Radio Receiver R-390/URR, block diagram.

## CHAPTER 6

### UNIT THEORY

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*e.* The output of first rf amplifier V201 is coupled to the grid of second rf amplifier V202. The gain of the first and second rf amplifiers is controlled manually by the RF GAIN control and automatically by the automatic gain control voltage. These stages amplify the rf signals before applying them to the mixer circuits. The output of the second rf amplifier (.5 to 32 mc) is fed to either the first or second mixer, depending on the MEGACYCLE CHANGE control setting. For frequencies from .5 to 8 mc, the rf signal is mixed



with the output of first crystal oscillator V401 in first mixer stage V203 to produce an if. signal which is variable in frequency from 9 to 18 mc. For frequencies from 8 to 32 mc, the rf signal is fed directly from the output of the second rf stage to second mixer V204. The heterodyning signal for this mixer is supplied from second crystal oscillator V402. The if. range of the second mixer output signal is 3 to 2 mc. It should be noted that the intermediate frequency at the output of the second mixer decreases as the input signal frequency increases. The input to third mixer V205 always has a frequency range of 3 to 2 mc except on the .5- to 1-mc band, in which case it has a frequency range of 2.5 to 2 mc. The output of vfo tube V701 is mixed with the input signal in the third mixer to produce a fixed frequency of 455 kc. The frequency range of the vfo is from 3.455 to 2.455 mc on all ranges of the receiver except the .5- to 1-mc range, in which case the upper frequency limit is 2.955 mc.

*f.* The 455-kc output signal of the third mixer is applied to the grid of first if. amplifier V501 either directly or through crystal filter Z501, depending on the bandwidth desired. For the two narrow pass bands, .1 and 1 KC, the crystal filter is used. Four additional degrees of selectivity that do not use the crystal filter are accomplished in the if. stages by the BANDWIDTH switch which varies the coupling between the primary and secondary circuits of the if. transformers. The if. amplifier consists of six stages, V501 through V506, which, together with the associated transformers, provide the required pass band. The output of fifth if. amplifier V505 is divided to supply a 455-kc signal to each of three stages: sixth if. amplifier V506, agc amplifier V509, and the cathode follower, one-half of V511. The output signal of the sixth if. amplifier is demodulated in the detector circuit, one-half of V507. An external diode load may be connected from DIODE LOAD terminal 14 and ground with the jumper between terminal 14 and 15 removed. The output of the fifth if. amplifier is amplified in agc amplifier V509, and the resulting signal is rectified by the agc rectifier, one-half of V510. When the FUNCTION switch is set for AGC operation, the gain of rf amplifiers V201 and V202 and of if. amplifiers V501 and V505 is controlled automatically by a dc voltage developed by the agc rectifier, one-half of V510, to keep the output level of the receiver relatively constant and independent of

signal strength variation at the antenna. Thus, for strong signals, the grid bias is high and the gain of the controlled stages is reduced and for weak signals the grid bias is reduced and gain of the controlled stages is increased. The response rate of the agc circuits can be controlled to satisfy reception requirements through the use of the AGC switch, the agc time constant circuit, and one-half of tube V511. For MGC operation, the agc bus is grounded by the FUNCTION switch. The cathode follower, one-half of V511, provides a low-impedance connection (50 ohms) from the output of the if. stages for use when the receiver is used for frequency-shift teletypewriter and single-sideband reception. To facilitate operation in the reception of radiotelegraph signals, in certain system applications and in calibration, bfo tube V508 provides a signal in the frequency range of 452 to 458 kc. This signal is mixed with the 455-kc if. output signal of the sixth if. amplifier to produce a beat frequency in the output of the detector in the af range. The output of the detector, one-half of V507, is coupled to the af amplifier, one-half of V601, through a negative peak limiter, one-half of V507, and a positive peak limiter, one-half of V510, which prevent noise peaks from exceeding average signal level. If operation without limiting is desired, the limiters can be disabled by a front panel control.

*g.* In addition to supplying signals to the limiter, the detector, one-half of V507, supplies a dc signal to the squelch tube, one-half of V601, which is a voltage amplifier. The average dc output voltage of the squelch tube varies in proportion to the average signal level. When the signal level drops below some predetermined noise level established by the setting of the RF GAIN control and when the FUNCTION switch is set for SQUELCH operation (not used on Radio Receiving Set AN/FRR-39), this voltage operates squelch relay K601, which short-circuits the output of the af amplifier V601 to quiet the receiver output. The output of the af amplifier also can be shorted to ground by break-in relay K602, when the FUNCTION switch is set to STAND BY, or to either MGC, AGC, or SQUELCH when the BREAK IN switch is set to ON and an external circuit provides a ground for the relay. The output from the af amplifier, one-half of V601, is applied through separate gain controls to a local af amplifier, one-half of V602, and a line af amplifier, one-



half of V602. The output of the local af amplifier supplies signals to local af output tube V603, which has connections for a speaker or a headset and for sidetone signals from an associated transmitter to

permit monitoring. The line af amplifier supplies signals to line af output tube V604 which has connections for a balanced line to the radioteletype terminal equipment.

## Section II. THEORY OF RECEIVER CONTROL C-975/URR

### 63. General

Receiver Control C-975/URR provides circuits to maintain automatic frequency control of the audio frequencies used in a frequency-shift keyed radioteletype system. The two channels are completely separate, but the power supply and metering circuit are common. Since the receiver control normally is used with extremely stable receivers, the receiver control functions chiefly to aid in tuning the receiving system and to minimize errors caused by drift in the transmitter frequency. The signal path for channel B is shown in figure 33. A complete schematic diagram is given in figure 35.

### 64. Block Diagram

*a.* If. output of the receiver (455-kc) is applied to the receiver control input receptacle. A single stage of if. amplification (signal if. amplifier V1501) is used and the resultant signal is applied to a detector (V1502A). Here it is mixed with the output of a bfo (V1509) operating at a normal 457.125 kc and the resultant 2,125 cps signal is coupled to the receiver.

*b.* Audio voltage developed in the signal detector also is applied to a cathode follower, V1502B, which provides proper matching to the band-pass filter (FL1501). The filter has an approximate center frequency of 2,125 cps and a band-pass range of approximately 1,750 through 2,500 cps. Note that the band-pass filter excludes the space frequency of 2,975 cps. Audio voltage developed across the filter load resistor is amplified by two af stages (V1504 and V1505) and applied to the input of a discriminator circuit.

*c.* The discriminator (V1507) is adjusted to operate with a center frequency of 2,125 cps. With a 455-kc signal input to the receiver control, the discriminator output is zero. When the input signal is above or below 455 kc, a negative or positive voltage, respectively, is obtained in the discriminator output. The amplitude of the negative or positive voltage depends upon the amount the input signal frequency differs from a center frequency of 455 kc.

*d.* The dc output voltage of the discriminator controls the bias on a reactance tube, V1508, which in turn controls the operating frequency of the bfo. With zero dc bias on the control grid of the reactance tube, the bfo operates at 457.125 kc. When the input signal to the receiver control varies from 455 kc the detector output varies from 2,125 cps, resulting in a dc control voltage at the output of the discriminator which acts to change the operating frequency of the bfo and shift the af output of the detector toward 2,125 cps.

*e.* The original if. input signal also is amplified by two if. stages (V1510 and V1511) and applied to another detector, V1512A, to give a dc control voltage that is applied to relay control tube V1512B. A relay in the plate circuit of the relay control stage controls the operation of the afc hold relay (K1501), thus controlling the connection of the discriminator output to reactance tube V1508.

*f.* The bias of the first if. amplifier is controlled by the AFC THRESHOLD potentiometer. When the input signal is of sufficient amplitude to overcome the bias on the first if. amplifier, the signal is amplified and controls the af discriminator output connection as described in *e* above. When the signal level is below the threshold level, no dc control voltage is applied to the reactance tube control grid. Several capacitors and a resistor are connected in the grid circuit of the reactance tube. The time constant of this network is relatively long. The charge existing on the capacitors, determined by the action of the discriminator while the signal level was above threshold level, discharges very slightly through the large effective resistance of the network. This maintains a dc control voltage on the control grid of the reactance tube for some time after the signal level fades below threshold level. The resultant bfo drift under these conditions will be less than 150 cps per minute.

*g.* With normal 455 kc input, the output of the detector V1502A (2,125 cps) is coupled through the band-pass filter circuit and the audio amplifiers to the input of the discriminator. Audio voltage developed in the plate circuit of the second

af amplifier also is coupled to the plate of bypass rectifier V1506. A negative dc voltage is developed by the operation of this tube. This negative voltage is used to bias filter bypass tube V1503 below cutoff and the tube cannot function. A portion of the negative voltage also is applied to the control grid of the first af amplifier to provide some automatic volume control action.

*h.* When the input signal drifts not more than several hundred cycles in frequency, audio voltage sufficient to operate the bypass rectifier still is developed in the plate circuit of the second af amplifier and the filter bypass rectifier remains biased to cutoff. Discriminator output, however, is not zero. A dc output results as described in *c* above. This control voltage varies the reactance-tube bias. Changing the bias varies the effect of the reactance tube on the bfo tank circuit. The bfo operating frequency changes and the resultant audio frequency developed in the detector stage shifts toward 2,125 cps. The af signal can only seek a 2,125 cps reference, since at that frequency the discriminator output is zero and the bfo operates at 457.125 kc. This cannot be achieved completely since the bfo is shifting in frequency to correct for an input error. Therefore a continuous hunting cycle continues to repeat and a small error in the af signal must exist when the afc circuit functions.

*i.* If the input frequencies should drift until the af signal falls outside of the range of the band-pass filter, audio voltage developed in the plate circuit of the second af amplifier is insufficient to overcome the fixed bias of the bias rectifier. This removes the source of voltage biasing the filter bypass stage to cutoff and the tube is free to conduct. The af signal developed in the plate circuit of the detector then is amplified in the filter bypass stage (V1503) and applied directly to the first af amplifier grid, thus bypassing the band-pass filter. The afc circuit then functions to shift the af signal

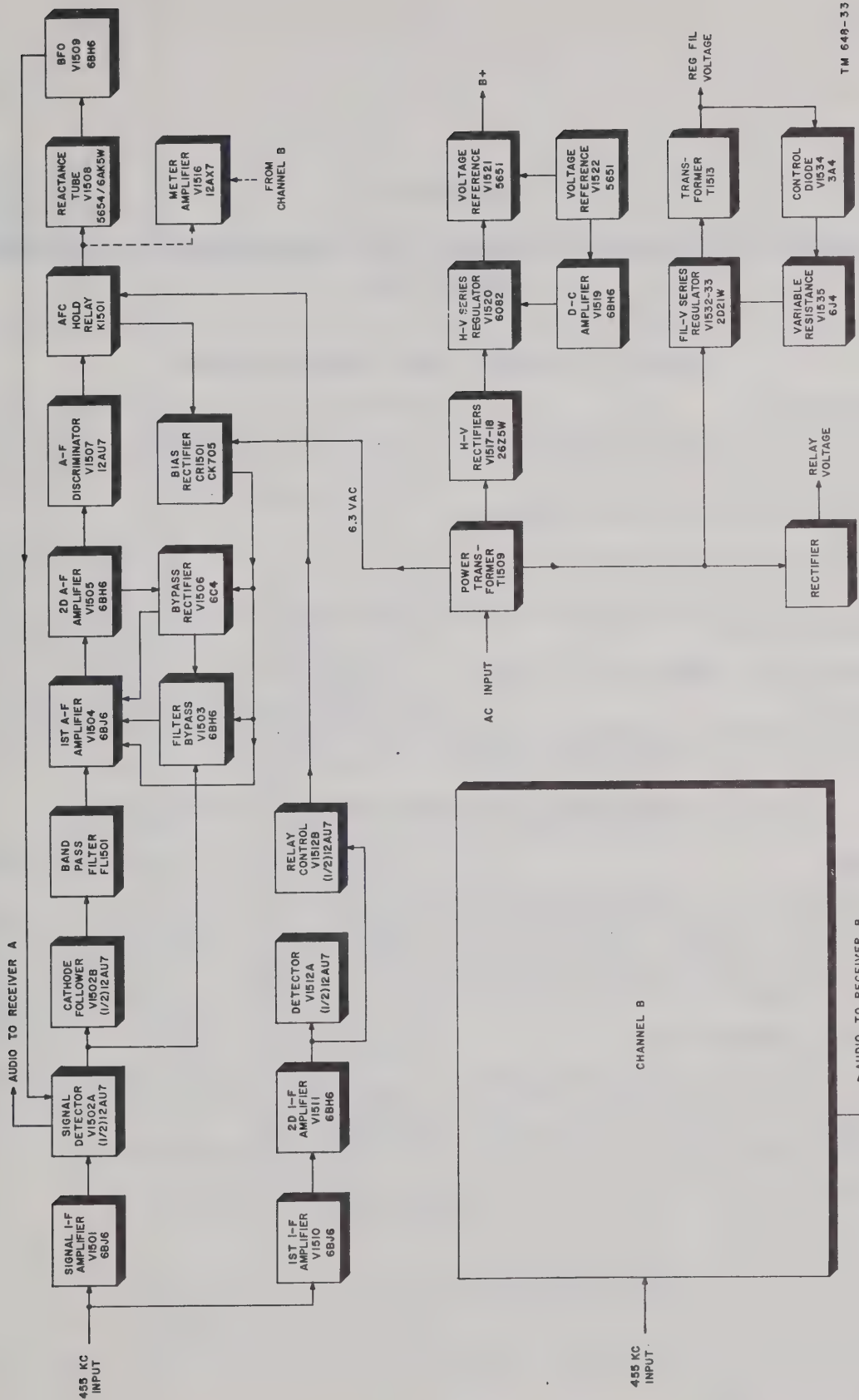
back toward 2,125 cps. As soon as the af signal frequency falls within the range of the band-pass filter, the filter bypass is biased again to cutoff and the circuit functions as described in *h* above.

*j.* When the input signal level falls below the threshold level as determined by the AFC THRESHOLD control, the afc hold relay control circuit does not function and afc hold relay K1501 is de-energized. A 6.3-volt ac is applied to the cathode (+ terminal) of rectifier CR1501 through contacts 4 and 12 of relay K1501. Rectifier CR1501 conducts and develops a negative voltage across its load resistors. This negative voltage is applied to the control grid of filter bypass tube V1503 and the tube is biased below cutoff. Stray noise voltages outside the range of the band-pass filter are thereby prevented from bypassing the filter and causing errors in the afc circuits.

*k.* The dc control voltages developed by the discriminator are also used to vary the bias on meter amplifier tube V1516. A microammeter in the plate circuits of the two triode sections of tube V1516 reflect these voltage changes. The meter is calibrated to give the approximate correction in kilocycles provided by the afc circuit.

*l.* The power supply of the receiver control consists of three sections, as follows:

- (1) A six-tube circuit provides a regulated +180 volts for screen and plate voltages. Most of the tubes in the equipment also obtain their source of 6.3 volts for filament operation from this section.
- (2) A four-tube circuit provides a regulated 6.3 volts for filament operation. The only stages in the equipment using this regulated filament voltage are the reactance tube and beat-frequency oscillator of each channel.
- (3) Voltage to operate the afc hold relays is obtained from a separate bridge rectifier circuit.



TM 640-33

Figure 33. Receiver Control C-975/URR, block diagram.



## CHAPTER 7

### SHIPMENT AND LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

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#### Section I. SHIPMENT AND LIMITED STORAGE

##### 65. Disassembly

The following instructions are intended as a guide for preparing the radio receiving set for shipment and storage.

- a.* Remove all outside leads such as antennas or ground wires.
- b.* Disconnect all external cabling.
- c.* Remove any headphones.
- d.* Remove the two receivers and the receiver control from the cabinet.

##### 66. Repacking for Shipment or Limited Storage

- a.* The exact procedure in repacking for shipment or limited storage depends on the materials

available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 16 of this manual and follow in reverse order the instructions given.

- b.* Whenever practicable, place a dehydrating agent such as silica gel inside the container. Wrap the units and spare parts in corrugated paper and protect each package with a waterproof barrier. Seal the seams of the paper barrier with a waterproof sealing compound or tape. Pack the sealed equipment in a wooden case provided with at least 3 inches of excelsior padding between the barrier and the wooden case.

#### Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

##### 67. General

The demolition procedures given in paragraph 68 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon the order of the commander.

##### 68. Methods of Destruction

- a. Smash.* Smash the meters, controls, tubes, coils, switches, capacitors, transformers, and headsets; use sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

- b. Cut.* Cut cords, headsets, and wiring; use axes, handaxes, or machetes.

- c. Burn.* Burn cords, resistors, capacitors, coils, wiring, and technical manuals; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

- d. Bend.* Bend panels, cabinet, and chassis.

- e. Explosives.* If explosives are necessary, use firearms, grenades, or TNT.

- f. Disposal.* Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

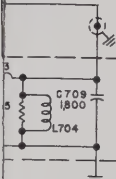
- g. Destroy.* Destroy everything.

J108  
BALANCED  
125 OHM  
ANTENNA

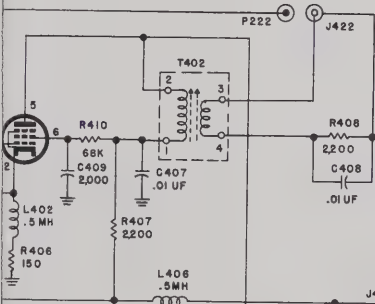
J107  
UNBALANCED  
WHIP

R126  
220K

P723



B+



J115-A

P715-A

PI13-A

C436

2000

J422

P222

T402

R408

2200

C408

.01 UF

R407

2200

C407

.01 UF

C409

2000

R410

68K

L402

.5 MH

R406

150

L406

.5 MH

C436

2000

J422

P222

T402

R408

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C408

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## CHAPTER 7

# SHIPMENT AND LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

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- e. Explosives.* If explosives are necessary, use firearms, grenades, or TNT.

- f. Disposal.* Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

- g. Destroy.* Destroy everything.



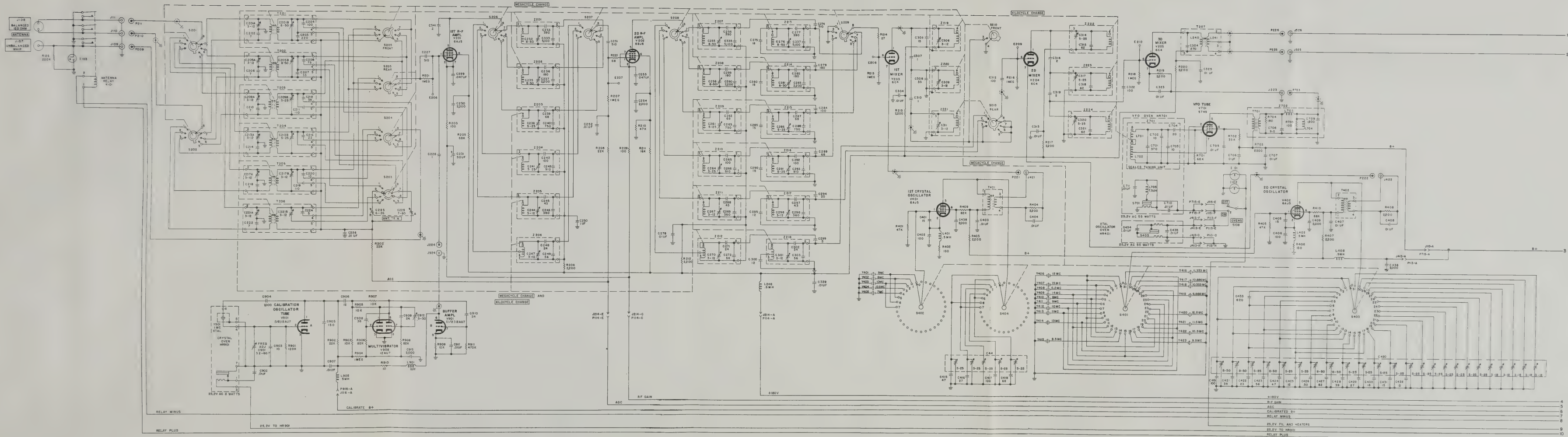
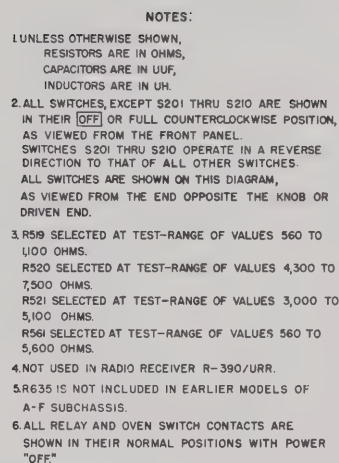


Figure 34. Radio Receiver R-390/URR, schematic diagram.









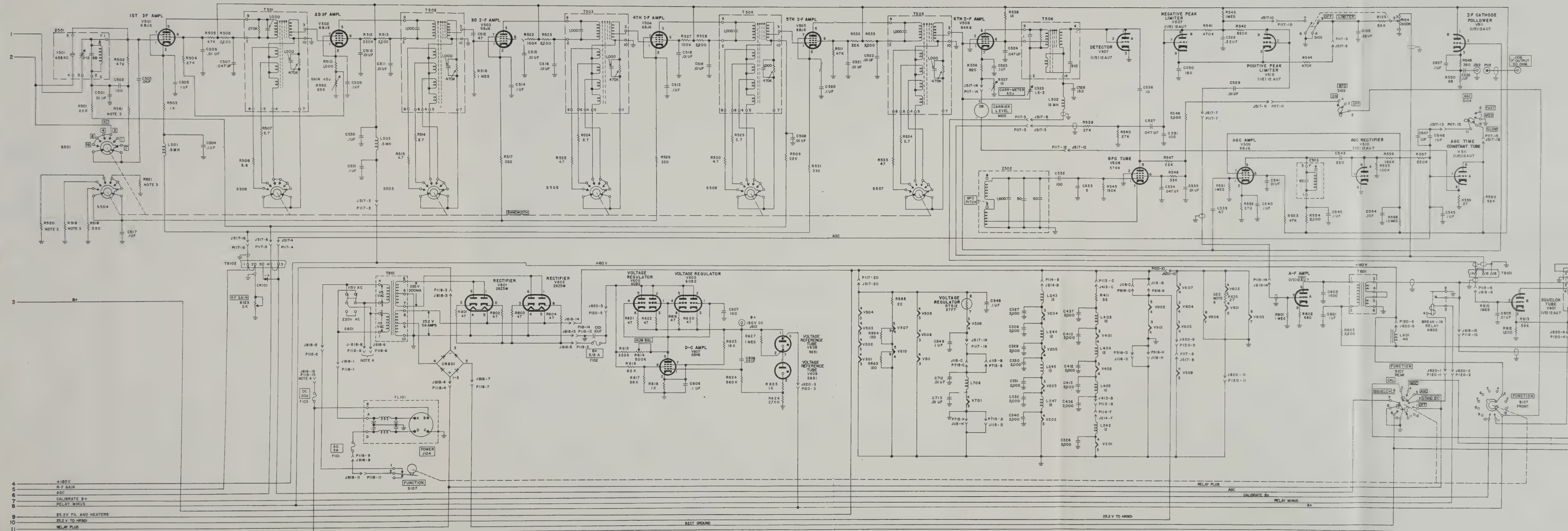
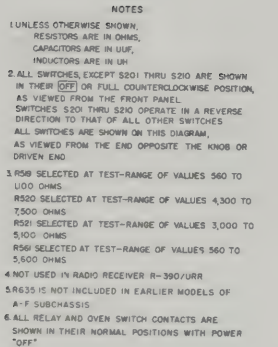


Figure 34—Continued.



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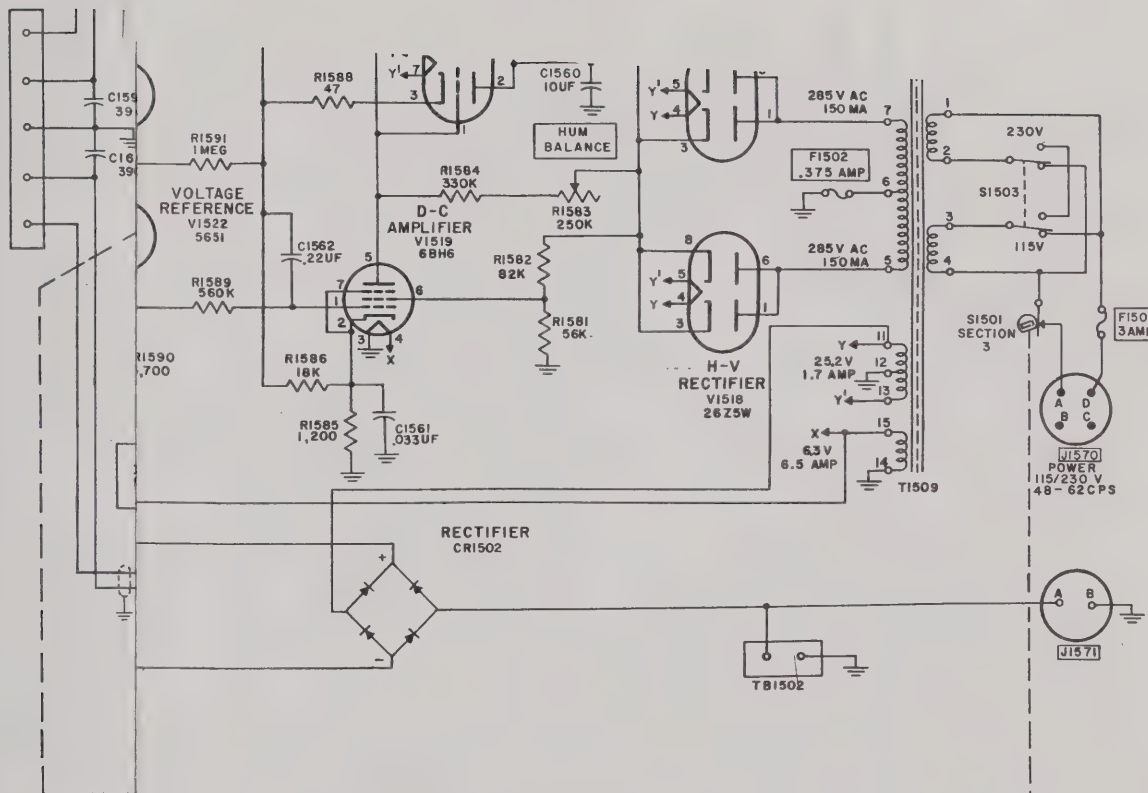
TO DIODE  
TRANSFORMER  
REC. A NO. 14

TO DIODE  
LOAD REC. A NO. 15

GROUND

TO DIODE  
TRANSFORMER  
REC. B NO. 15

TO DIODE  
TRANSFORMER  
REC. B NO. 14



- NOTES :
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.  
K - THOUSANDS  
MEG - MILLIONS
  2. ALL SWITCHES ARE VIEWED FROM THE END OPPOSITE THE KNOB OR DRIVEN END.
  3. TERMINALS NEAR V1508 (OR V1530) REFER TO TERMINALS OF Z1501 (OR Z1502). Z1501 % R1543, R1544, R1545, R1644, L1506, C1527, & C1529. Z1502 % R1636, R1637, R1638, R1643, L1523, C1589, & C1591.

TM 648-1





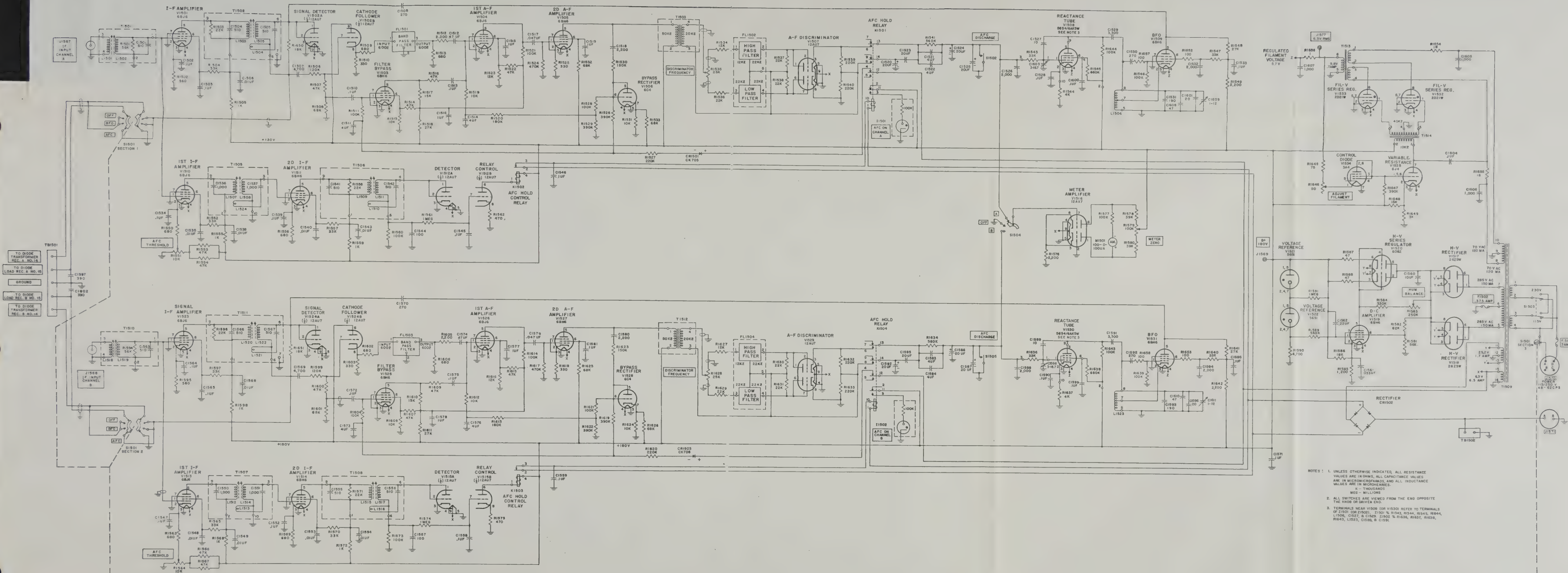


Figure 35. Receiver Control C-975/URR, schematic diagram.



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For explanation of abbreviations used, see SR 320-50-1.



**TM 11-648—RADIO RECEIVING SET AN/FRR-39—1954**